Mekelle University

College of Business and Economics

Department of Management

The Status of Resettled Households on Food Security: (The Case of Kafta Humera Woreda, Tigray, Ethiopia)

By

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Declaration

This is to certify that this thesis entitled "The status of Resettled Households on Food Security: The Case of Kafta Humera Woreda" submitted in partial fulfillment of the requirements for the award of the degree of MA, in Development Studies to the College of Business and Economics, Mekelle University, through the Department of Management, done by Ato Bahabelom Ebuy, Id.No. FBE/PR0008/00 is an authentic work carried out by him under my guidance. The matter embodied in this project work has not been submitted earlier for award of any degree or diploma to the best of my knowledge and belief.

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ABSTRACT

Food security in Ethiopia has remained an unfulfilled dream for a considerable number of people for a long and continuous period of time .Resettlement program is, thus, one among different development alternatives designed and implemented by the existing government to help people from densely populated and drought prone areas as well as displaced citizens and the unemployed youth get work and live in fertile areas of the country so as to do away with the resultant problems.

This being so, this research work is undertaken to critically appreciate the program by examining the food security status of resettlers in the study area ; assessing the determinants of household food security differentials ;assessing the impact of the program on the environment ; and forwarding certain suggestions for ways of improving the program should the need arise.

To this end, Descriptive statistics,Aggregated Household Food Security Index (AHFSI) , food balance sheet and binary logit model were used. Both primary and secondary data were also employed in getting the necessary information for the analysis of the study. 'Tabias' with settlers for a relatively longer period of time and with relatively larger forest wild life were selected in order to respectively reflect the degree of food security or otherwise in households and the consequences of resettlement on environment. Sampling in each 'Tabia' was based on the proportion of the population in the respective 'Tabias'.

As a result, taking food poverty line (2200 kcal) as a yardstick, it was found that around 68 % (i.e., 2/3) of households in the study area are food secure while the remaining balance of 32% (i.e.,1/3) of the households are insecure. Moreover, the result was also reinforced by the fact that the resettlers are food secure (and self-sufficient) at household level witnessed by both AHFSI and food balance sheet of the Woreda. All in all, this state of affair indicates that resettled households are food secure and self sufficient in food in the areas visited for the study.

The result of the logistic regression model revealed that among the fifteen variables considered in the model, four explanatory variables were found to be significant up to less than 10 % probability level. These significant variables include farm size, initial income, irrigation use and age of household heads. Identifying and understanding factors that are responsible for household food security status and its determinants is important to combat food security problems at the household level. The study findings suggest that in selecting priority intervention areas, the food security strategy should consider statistically significant variables as the most important areas.

Study on development program will, however, be meaningless if it passes by without touching developments effect on environment. In a nut shell, the achieved objectives of the development program may not be sustainable if the negative environmental impacts of resettlement continue unchecked.

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Acronyms and Abbreviations

ADLI – Agricultural Development Led Industrialization

AE– Adult Equivalent

CSA _Central Statistical Authority

DAP– Dominium Phosphate

DFID – Department of International Development

DPPC– Disaster Prevention and Preparedness Commission

ha – Hectares

HH– Household

HHICES– Household Income Consumption and Expenditure Survey

BOFED – Bureau of Ministry of Finance and Economic Development

EPRDF – Ethiopian People's Revolutionary Democratic Front

IFAD – International Fund for Agricultural Development

FAO – Food and Agriculture Organization of the United Nations

FDRE – Federal Democratic Republic of Ethiopia

FFSS– Forum for social studies

FSCB – Food Security Coordination Bureau

FSP – Food Security program

IDMC–Internal Displacement Monitoring Center

Kcal– Kilo calorie

Kg– Kilogram

km– kilometer

masl-Meters above sea level

MOA– Ministry of Agriculture

MoFED– Ministry of Finance and Economic Development

PRSP – Poverty Reduction Strategy Papers

PHH– Per Household

PP– Per Person

Qt– Quintal (100kg)

SDPRP – The Sustainable Development and Poverty Reduction Program

SNNPR – Southern Nations Nationalities and Peoples Region

SD– Standard Deviation

SPSS– Statistical Package for Social Sciences

SSA– Sub-Saharan Africa

TLU – Tropical Livestock Unit

USDA – United States Department of Agriculture

UN– United Nations

WARD– Woreda Agricultural and Rural Development

Chapter One

1. Introduction

1.1. Background and Justification

Economic and political transitions in countries of Asia, Africa, Latin America and the Pacific have made migration a salient feature of life in developing countries (Gurmu et al, 2000 cited in Blessing, 2006). Ethiopia is one of the countries in Africa with a relatively high level of internal migration and population redistribution (Adepoju, 1977). This is associated with critical political changes since the 1970s through 1990s, and civil war and famine (Kiros et al, 2001 cited in Blessing, 2006). Researchers, for example, Gebre (2001) and Ezra (2001) have shown the character, direction, and volume of migration in Ethiopia in the last two to three decades as they have been shaped by political instability, decline in the agricultural sector and government resettlement policies of the 1980s.

The concept of resettlement, land settlement, colonization and transmigration refer either to planned or "spontaneous" redistribution of a given population. For Ethiopia, the term "resettlement" refers to relocating people to areas other than their places of origin in response to adverse socio-economic, political and environmental conditions (Pankhurst, 1988) by official government policy.

Recent studies have also established links between migration and food insecurity (Gebre, 2001). However, the links between migration and household welfare have not been made. Particularly, resettlement programs as a means of source of sustainable livelihood security has become questionable with white and black conclusion (Pankhurst, 1988).

The history of Ethiopia in the last three decades made out migration for many not just the rational choice but the only choice. Dejene (1990) suggests that migration from the villages of Wollo in northeast Ethiopia to the resettlement villages was a last resort and for migrants the choice was often between death

and migration. Consequently, those who move were often the economically marginally-embedded in the place of origin with no locational incentive to stay.

Under these circumstances, the potential outcomes of such moves are hardly optimistic.

According to the World Bank (1978), the destination of resettlement is to areas with underutilized agricultural potential, and movement could take place as a result of planned intervention or spontaneously**.** However, as different literatures try to indicate, settlement schemes will not be successful unless the people are involved willingly to participate in it. The voluntary participation of the peasantry is, therefore, of paramount importance, and also it is the task of implementing agencies to convince the prospective candidates of the benefits of resettlement. Indeed, settler candidates should be directly involved in the planning and preparation of resettlement schemes (Rahamot, D, 2003).

The major objective of the resettlement program, which involves voluntary participation, was and is, therefore, mainly to rehabilitate people affected by drought induced famines and make them attain food security through improved access to land and availing institutional support and thereby bring about a reasonable balance between population and resources necessary to sustain it. Though many literatures advocated that resettlement is among the means of alleviating poverty, they didn't show to what extent the programs affect livelihood improvements of resettles .Also, they didn't address the question of sustainability.

Questions such as whether the removal of a small population from a given heavily dense area will reduce population pressure, whether resettlement will provide lasting solutions to the problem of food insecurity, whether resettlement is providing a more rational use of available land by readjusting man land ratio are open for discussion and further investigation (Pankhurst, 1992).

Hence, the principal rationale to conduct this study is to see the actual effects and determinants of socio-economic improvement with various indicators vis-à-vis environmental protection, and to assess the effects of the program.

1.2. Problem Statement

Resettlement entails migration or the act of moving of people from place of origin to another. The end result of this act affects people's livelihoods and their economic landscape in different ways.

Resettlement also implies migration controlled by the state, and hence, government policies. Those policies affect people's livelihoods in different ways too.

The resettlement program is deemed to improve people's livelihoods particularly their level of food security by providing them with amongst other things, but most prominently, access to farmland. Migration is also increasingly seen in development theory as an important livelihood strategy for poor people and a strategy that should be encouraged (De Haan, 2002).

Resettlement program undertaken by different Ethiopian regimes have declared objective of improving the life of the rural people affected by drought induced famines, among others. However, failures of the relocation attempts of the past regimes have been experienced. The worst case recorded was the resettlement program during the Military Marxist-Leninist Government of Ethiopia from 1974 to 1991 (Clapham, 2002).

Then as now, food insecurity was the backdrop of the program, the government claimed that its motive for resettling people was to alleviate people's sufferings caused by the well-documented famine in Ethiopia in the mid-eighties. It is however generally agreed, both inside Ethiopia and internationally, that the program was a failure, and many people suffered because of it.

Nevertheless, the Ethiopian past experience being as it is, recently disclosed literatures on the subject at issue indicate that if population resettlement is based on adequate studies, socially accepted, properly implemented, monitored, and evaluated, it would enable to bring rational utilization of resources. It could create favorable conditions for introducing and implementing improved agricultural methods and better resource utilization system. Otherwise, the short term gain in food security may overshadow the long term irreversible cost of natural resources degradation at the resettlement sites.

Population resettlement, hence, could be a means to alleviate social and economic problems and lead to overall development. Here, it is crucially important to see development in its not just attaining food security (economic aspect), and it should also be perceived vis-à-vis sustaining livelihood security and

social indicators of adaptation, wellbeing and integration. Otherwise, it is hard to ascertain development without having mentally settled resettlers and perhaps a cause for lots of deforestation and misuse of natural resources.

In such bad situation, the displaced people and the host communities would ultimately face many social and economic problems and utterly impoverished. Beyond that, the people could lack confidence on the government and the leading political party, and show resistance to any kind of intervention (Rahamot, D.2003).

It is with this backdrop that the paper provides a good opportunity to examine survey data from Kafta Humera for evidence of whether the resettlement program during the last six years has been translated in to improved economic circumstances of voluntary resettled households, and its environmental impact in the settlement sites.

In a nut shell, resettlement programs are ultimately designed to improve socio-economic conditions (to bring about economically & socially stable people), food security, with proper management and utilization of resources in the settlement areas. Resettlement programs are also assumed to create the possible introduction of proper use of resources, create opportunities of engagement for some of the underemployed sector of the society, and create conducive situation for introducing and implementing improved agricultural methods and better resource utilization.

But, are these programs really working for which they are designed? Has this state instigated internal migration ensured food security (long lasting livelihood developments) in accord with environment?

1.3. Objective of the Study

1.3.1. General objective

The overall objective of this study is to explore how government instigated internal migration (resettlement) is affecting people's livelihoods in terms of food security on the one hand and environmental consequences on the other.

1.3.2. The specific objectives are:

1. to assess some of the resource endowment of the study area

2. to describe the socio-economic conditions of the resettlers

3. to examine food security status of re-settlers in the study area at the household level.

4. to assess the determinants of household food security differentials in the study area.

5. to assess the impact of the resettlement program on the environment.

6. to put forward possible suggestions and recommendations that would contribute to improved outcomes of the program in the area of interest.

1.4. Research hypothesis

The study will examine the impact of the program on socio-economic improvement of settlers and environment based on the following hypothesis.

H_1: **Resettled households are food secured and food self sufficient.**

H_2: **There is no significant difference between food secure and insecure resettlers in:**

- **age of household heads**
- **family size of households**
- **dependency ration of households**
- **sex of household head**
- **cultivated land holding size**
- **livestock holding**
- **average farm income and estimated food expenditure**

H_3: There is no difference between average land holding size of the sample households and national average land holding size of households.

H_4: There is no difference between average resettlers' livestock holding before their resettlement and average resettlers' livestock holding after their resettlement.

H_5: **Resettlement has negative impact on the environment in terms of deforestation.**

1.5. Scope of the study

In Ethiopia, in different places, resettlement programs have been carried out in different periods. Of the resettlements undertaken in different Tabias of Kafta Humera Woreda, two Tabias have been selected. In selecting the Tabias and resettlement sites, special attention was paid to status of resettlers on food security and its determinants with respect to general socio-economic conditions at a household level. In other words, it is to determine to what extent re-settlers have improved their livelihood since their arrival (2003) at the new re-settlement areas vis-à-vis its determinants. Moreover, it attempts to investigate the current ongoing development activities in the area with respect to the effects of such development programs on the environment of the area, to identify the constraints of the resettlement policy of the country (if any), and thereby to develop intervention strategies so as to bring about sustainable development in the area of concern. The research work has been carried out in the months of October - February 2009.

The study focuses on household living conditions on the premise that poverty is about people and its detrimental outcomes play out in the living conditions of men, women and children in the household (Gage et al., 1997).

In this paper, household heads are chosen as the reference persons based on the assumption that the economic circumstance of the head of a household is the single most important indicator in determining a family's economic status (McLanahan and Booth, 1989 cited in Blessing, 2006).

In addition to the state sponsored resettlement, there is what is known as self- sponsored or spontaneous migration and settlement. This spontaneous population movement was mostly to get better agricultural

areas and for involvement in trade (pull factors) as well as to seek of land and get ride of drought stricken areas (push factors).

This paper concentrates on the state sponsored population resettlement program.

1.6. Significance of the study

There are diverse views on the overall impacts of the on-going resettlement program by the Ethiopian Government. Such diversities usually result from the different dimensions considered in the impact analysis. These dimensions could be financial, economic, social, or environmental one.

Researchers try to indicate that the current resettlement program is narrowly focusing on shifting of people from the densely populated to sparsely populated areas of high potential agricultural land. That is, farmers continue to practice the unsustainable system of production in virgin lands, thus, presenting grave consequences by creating catastrophic environmental conditions.

The data collected in this study can serve as a base line to determine the actual effect of the program with respect to environment so as to take appropriate measures by any concerned government body.

Some researchers have also been carried out on socio-economic improvement disregarding the extent to which the resettlers show an improvement in their livelihood.

Besides, many things are unclear about the issue, particularly on factors influencing food security at the household level, as the general survey may not be appropriate for bringing about possible solutions. On top of the above, the studies did not show how sustainable the programs are using different indicators as yardstick for development. Therefore, understanding the effects of resettlement on living conditions at the household level can aid government in designing sound policies related to the wide-ranging problem of poverty in Ethiopia.

This research paper hence gave due attention on empirical assessment of potential research gap of knowing the extent the livelihood strategies attain on food security; reduced poverty vis-à-vis the impact on environment and how it is sustainable in ensuring development and its implication to natural resource conservation.

To study a specific resettlement program, therefore, provides the opportunity to study aspects of resettlement in relation to people's livelihoods and environment in general. In short, the results will be an eye opener to policy makers and development agencies in the country.

1.7. Organization of the study

The paper is organized into five chapters. Chapter one deals with the introductory part. Chapter two deals with review of literature that includes theoretical frameworks of food security and empirical studies made in the country. Chapter three presents a brief description of the survey area and methodology employed in data collection and analysis. Results obtained are discussed in chapter four and finally chapter five presents the summary, conclusion and recommendation of the study.

Chapter Two

2. Conceptual Framework and Literature Review

2.1. Introduction

This chapter provides an overview to the basic concepts of the research topic, points out the importance and difficulty of food security measurement, and reviews the programs and empirical results of resettlement in the country since the program's inception. Moreover, the chapter enumerates the various reasons for failure or success of resettlement programs in achieving their set objectives in the country.

2.2. Concept and definitions

2.2.1. Definition of terms

In this research work the researcher has used the following three CSA's (2005) standard definitions of terms;

Household. It consists of a person or group of persons irrespective of whether related or not who normally live together in the same housing unit or group of housing units and who have common cooking arrangements (CSA, 2005).

Head of household. It refers to a person who economically supports or manages the household or for reasons of age or respect is considered as "head of household" by members of the household or declares himself as head of a household. Here, head of a household could be male or female (Ibid).

Member of a household. It refers to persons who lived and ate with the household for at least six months including those who were not within the household at the time of the survey and who are expected to be absent from the household for less than six months. It also includes:

I. all guests and visitors who ate and stayed with the household for six months and above.

II. housemaids, guards, baby-sitters, etc. who lived and ate with the household even for less than six months (Ibid).

Calorie. It is the energy required to heat one gram of water by one degree Celsius.

The researcher has also used the following four definitions employed by Yntiso (2004).

Voluntary resettlement. It refers to a situation where migrants are entitled to make informed and free relocation decisions and the willingness to leave their original place.

Induced-voluntary movement. It occurs when people leave their home place to settle elsewhere as a result of deliberate acts of inducements coming from outside agencies.

Involuntary migration. It takes place through the forcible uprooting of people from their original place of residence either by natural disasters and/or human agencies.

Compulsory-voluntary migration. It occurs when people accept forced removal out of sheer desperation, and when these voluntarily resettled people are denied the right to leave the resettlement area.

2.2.2. Understanding the concept of resettlement

As a result of population pressure and natural resources degradation, the resettlement of people in new locations has become a strategy to alleviate several socio-economic problems. Resettlement whether designated as land resettlement, colonization, or transmigration refers to the phenomenon of population redistribution, either planned or "spontaneous" (Rahamot, 2003a).

In Ethiopian context, resettlement suggests the deliberate moving of people to areas other than their own. Resettlement is characterized by two main features: a movement of population, and an element of planning and control (Chambers, 1969). This being the narrower definition, the broad definition embraces the meaning of where people may be involved in resettlement either on their own initiative or under external circumstances which forces them to do so. The situation where people resettle to a new place under their own initiative is referred as" spontaneous resettlement" while the resettlement that is imposed on people by external agent in a planned and controlled manner is called "planned".

Some writers also categorize resettlement as voluntary or involuntary (Oliver and Hansen, 1982). The voluntary resettlement aspects consist of hunting and gathering, nomadism and shifting cultivation while the involuntary type embraces forms such as refugee, evacuee and resettlement (Parnwell, 1993). In this case, Parnwell (1993) defines resettlement as the process whereby people are displaced from their home by such phenomena as natural disasters, including drought, and by various infrastructure projects. People are moved to new locations and, generally, are given assistance by government in order to establish themselves therein. This form of movement, in most cases, is planned and controlled resettlement and

hence is a form of involuntarily population movement because, given the choice, the resettlers would generally have preferred to stay in their home of origin (Parnwell, 1993).

Still a modified conceptual scheme has been proposed by Yntiso (2004) where he identifies four major types of relocating people: Voluntary, induced-Voluntary, involuntary or forced, and compulsory voluntary.

Be as it may, the form/type of resettlement dealt within this research paper is what is known as "planned and controlled population movement under state control" for food security and developmental purpose (Tadesse, 2005 cited in FFSS, 2005). That is, so as to provide food security for people suffering from lack of food due to the ecological deterioration and shortage of land in their origin of home areas, and to develop the area of resettlement to a place suitable to live and work in.

Resettlement has become a feature of many part of third world where human activity is to a large extent controlled by nature. In this regard, people move periodically between different areas and ecological zones in order to cope with the prevailing natural constraints as and when undertaking their livelihood activities (Tadesse, 2005 cited in FSSS, 2005).

2.2.3. The concept of food security

Traditionally, food security has been measured by aggregate food supplies consisting of availability, accessibility, and adequacy (FAO, 2003). This aggregate supply side of food security at the nation level was, however, found to be inadequate and was replaced by putting emphasis on the individual/household level. To this end, several approaches to measuring food security applying variables such as household and income, height to weight ratios and the like were designed and thought to correlate with food security (FAO, 2003).

Nonetheless, there occurred dissatisfaction with these measures and thereby brought about the use of direct measures of food security such as household food consumption data (based on recalls) and qualitative measures based on subjective household survey questionnaires (Maxwell,1992) to address the issue in a more meaningful manner.

A more refined definition was that given by FAO (2002) as a situation that exists when all people, at all times, have physical, social, and economic access to sufficient, safe and nutritious food that meets dietary needs and food preferences so as to allow one an active and healthy life .

As illustrated in the Figure 1, there are two major factors affecting conceptual framework of food security. (1) The physical determinant that involves the food flow consisting of the availability, accessibility, use and utilization, and (2) temporal determinant of food and nutrition security refers to stability, which affects all the three physical elements.

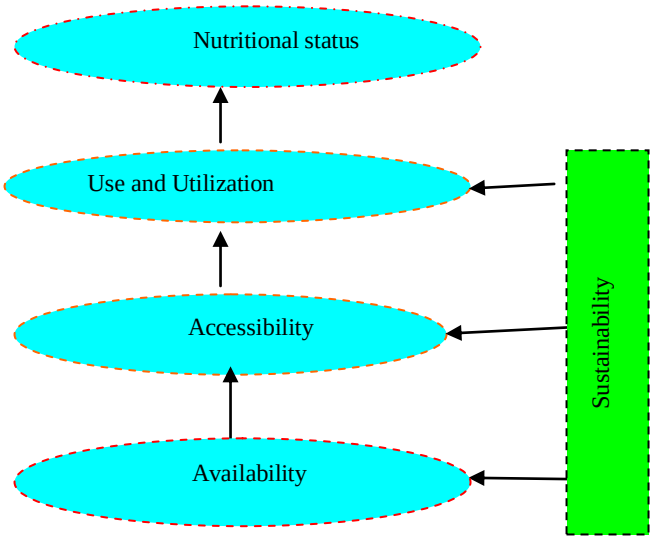


Figure 2.1: Conceptual framework of food security (Quisumbing and Agnes, 1995)

2.2.3.1. Household food security

Household food security refers to the ability of the household to secure, either from its own production or through purchases, adequate food for meeting the dietary needs of all members of the household (USAID, 2004). Here year-round access to household's amount and variety of safe foods to their members is considered as requirement to lead an active and healthy life.

2.3. Food security situation in Ethiopia

The extent of hunger and food insecurity in a country is an important indicator of standard of living (Anand and Harris, 1990). The Food and Agriculture Organization of the United Nations (FAO, 2003) estimates around 800 million people worldwide to be food insecure.

Ethiopia, one of the most famine-prone countries in Africa, has a long history of famine and food shortages (Ramakrisha and Demeke, 2002).

More than half of the Africa's food insecure populations live in Ethiopia and five other countries such as Chad, Zair, Uganda, Zambia and Somalia (Ramakrisha and Demeke, 2002). Most famine and food crises in Ethiopia have been geographically concentrated in two broad zones. The first zones consists of the central and northern highlands, stretching from northern Shewa through Wello and Tigray, and the second is made up of the crescent of low-lying agro-pastoral land ranging from Wello in the north , through former provinces of Hararghe and Bale to Sidamo and Gamo Gofa in the south (ibid, 2002).

Though food insecurity has been prevalent in both rural and urban areas of the country, the rural areas, where the overwhelming proportions of Ethiopians live are harder hit by the problem. (FDRE, 2001). Millions of households in rural areas of Ethiopia suffer from chronic food insecurity and receive food aid on an annual basis. This emergency appeals and others costs on average of $265 million from 1997-2002 to assist a population of greater than 5 million per year (FSCB, 2004).

A combination of factors has resulted in serious and growing food insecurity problem in the country, affecting as much as 45% of the population. Adverse changes in climate combined with other factors such as policy- induced stagnation of agriculture and the internal conflict that took place in the country in the 1970s and 1980s are among the ones that expose lack of enough food to about four million people in rural areas in each year of past 35 or so years (FDRE, 2001).

Over the past decade, more than five million people on average have required food aid each year, even during years of seemingly normal weather and market conditions. Over the past fifteen years an average of 700,000 metric tons of food aid per annum have been imported to meet food needs (ibid, 2004).

Ethiopia has, therefore, been one of the largest recipients of emergency food aid in Africa for the past decade (ibid, 2004).

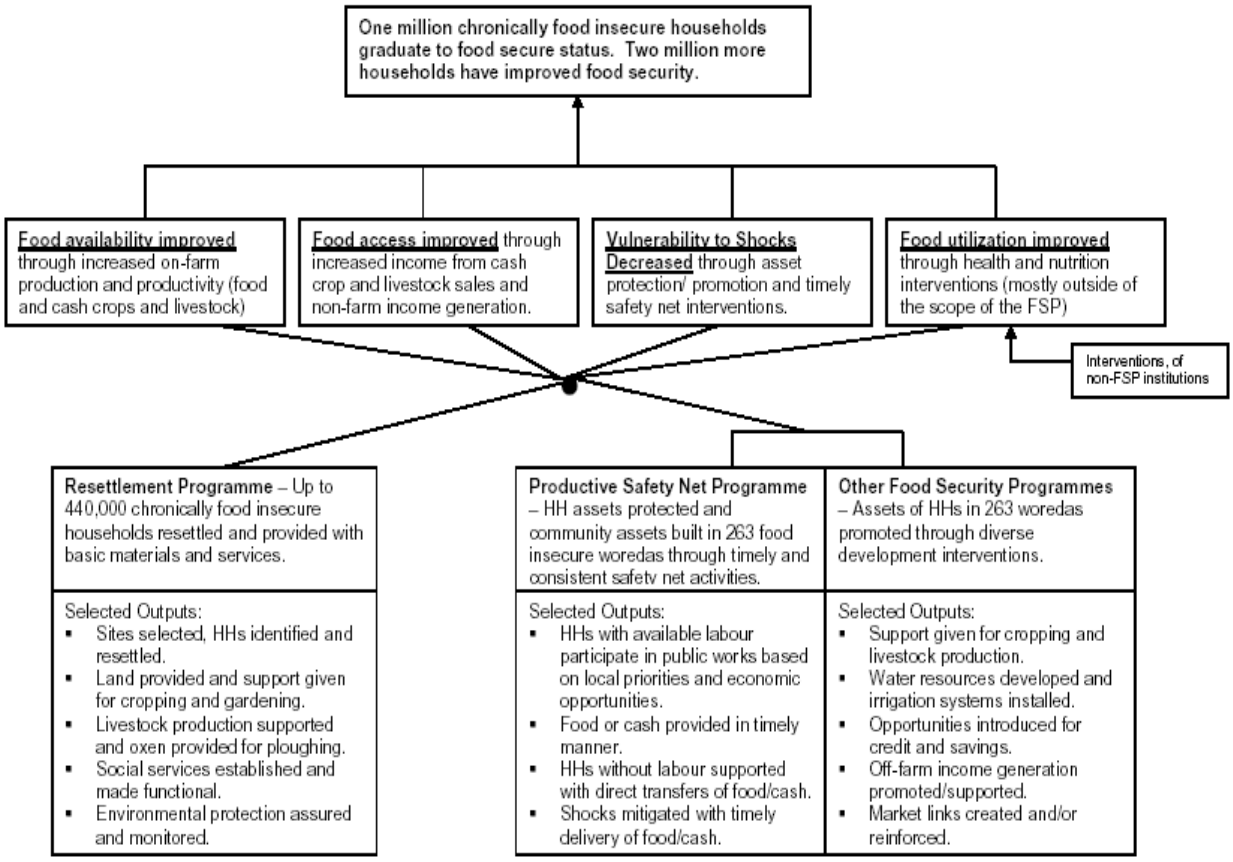
This emergency appeals, however, have had limited effectiveness at protecting productive assets and mitigating drought shocks.

As a result, the Government of Ethiopia has revised its strategy of distributing food aid within framework of economic policy of Ethiopia that aims at ensuring rapid and sustainable development through an agriculture-centered development strategy. This strategy is known as Agricultural Development Led Industrialization strategy (ADLI), and concentrates mainly on the linkages between agriculture and other sectors of the economy (FDRE, 2008).

Agriculture growth is seen as a guarantee against food insecurity in the country. The food security strategy in Ethiopia is based on three important aspects: a) increasing food and agricultural production, b) improving food entitlement and c) strengthening capacity to manage food crisis.

In short, so as to realize the above mentioned objectives, two major food security strategies have been followed in 2003 and 2005. The main components of food security program (FSP) are: resettlement program, productive safety net program, and other food security program.

This research work, however, concentrates on the Resettlement Program aspect of the country's Food



Security Strategies though some mention is made of the other two components to fill a possible gap to achieving a food security program (FSCB, 2004).

Figure 2.2: Graphic Representation of the Food Security Program Logical Hierarchy of Objectives (FDRE Food Security Coordination Bureau, 2004).

As can be seen from figure 2.2, the very logical objective of this resettlement program is to make resettlers achieve food secure status solely through a given component of interventions. This package of intervention consist of resettlement in selected sites, provision of land and related support for cropping and gardening , provision of oxen and other livestock with the required and relevant supports , establishments of basic infrastructure as well as taking steps to mitigate any possible negative social and environmental impacts that could emanate from such resettlement programs (FSCB, 2004).

The Bureau claims that resettlement follows the following logical sequence when being accomplished:

- Sites are selected and households identified and resettled.
- Household are provided with land and given support for cropping.
- Household are provided with oxen for ploughing and support for livestock production.

- Social services are established and made functional at the resettlement areas.
- Environment protection are assured and monitored around the resettlement sites so as to mitigate negative social and environmental impacts due to the resettlement program.

Normally, a resettlement program activity takes place during a slack period in the agricultural calendar which, in the Ethiopian circumstance, in most cases is during the months of mid-December to mid-April.

Potential resettlers are identified by respective authorities of the 'woredas' and 'kebeles' of the voluntary participants of the resettlement programs, and are sent to the identified host woredas (appendix 1) with available arable land. Such areas, in addition to having adequate arable land are supposed to have basic infrastructure such as water supply, health services, primary schools, roads and the like. Households are also entitled to an eight-month period (or an amount enough to last until the first successful crop harvest) of food ration as and when they reach their respective resettlement areas. Furthermore, other input such as chemical fertilizer and farming tools are provided to the resettlers in question.

2.4. Consumption poverty in Ethiopia

Ethiopia is one among the seven African countries that constitute half of the food insecure population in sub-Saharan Africa (Sisay, 1995 cited in Alem S., 2007). According to the Food and Agricultural Organization (FAO) report of 1999, average caloric intake in rural areas is 1,680 kilo calories per person per day, which is far below the national medically recommended minimum daily intake of 2,100 kilo calories per person per day. As per the Federal Democratic Republic of Ethiopia Food Security Strategy (FDRE FSS) issued in 1996, the recommended minimum daily intake of 2,100 kilo calorie per person per day is equivalent to 225 kilogram of grain per person per year.

The household income consumption expenditure survey (HHICES) based on a basket providing 2,200 kcal per adult equivalent per day and non- food components showed that the per capita consumption

expenditure of the country for the 1999/2000 was estimated at Birr 1057 at 1995/96 constant price (MoFED 2002).

Viewing it region wise, while in rural Tigray it was found to be Birr 1,176.066 with food expenditure Birr 753.054 and non-food expenditure accounting Birr 423.012.

From the analysis, the portion of the Ethiopian people who are absolutely poor in 1999/2000 was 44.2% made up of 37% in urban areas and 45 % in rural areas which, in turn, indicates that rural poverty is higher than urban poverty (MoFED, 2002).

Survey also indicated that income distribution in Ethiopia to be more evenly distributed in both rural and urban areas compared with other sub—Sahara African countries with a Gini coefficient of 0.28 in the year 1999/2000. Moreover, a higher Gini coefficient (0.38) in urban areas of the country was observed when compared with rural areas (0.26) indicating that income distribution is relatively evenly distributed in rural areas than in urban areas in the country (MOFED, 2002).

Like that of the level per capita consumption expenditure, levels of poverty incidence also showed significant variations across different regions. As a result, the highest poverty incidence was observed in Harari followed by Addis Ababa and Dire Dawa. Seen from the point of view of urban areas, the highest poverty was recorded in Tigray followed by SNNPR, Gambela, and Addis Ababa (MoFED, 2002).

2.5. Food insecure weredas in Tigray

Tigray region is one of the food insecure regions of the nation**.** Draught and famine have been routine occurrences in the region since the 1970's. One of the latest reports on the subject indicates that "… there are 1,831,600 people in need of relief food assistance in Tigray Region (excluding West Tigray Zone) due to complete failure of 'belg' and poor 'meher' production [and] delayed on set of 'meher' rains (by five months compared with the normal time)…."(BoFED,2007).

Prior to 1995 E.C; the regional government has identified 16 weredas as food insecure. The selection criteria were more of qualitative nature. The major criteria include: recurrent drought, number of population in permanent food shortage, etc. The affected areas included "….Atsibi-Womberta, Wukro, Erob, Gulo Mekeda and Ahferom Woredas in the Eastern Tigray Zone and Raya Azebo, Hintalo-wajirat, Alamata and Endamehoni in the South Tigray Zone. Gradually, however, the number of food insecure

weredas has increased from 16 to 31 as reported by the food security office of Tigray Region (Ibid, 2007).

A mix of proposed solutions to confront the challenges includes resettlement. The idea of resettlement has not been new to Tigreans but the destinations, scale - the number of people involved - as well as the objectives seems changed over time.

According to recent data obtained from the Tigray Bureau of Agriculture, out of the 36 weredas of the region, only three weredas are food secured.

2.6. Development in measuring food security:

Why it is so important and yet so difficult to do?

How best to measure household food insecurity/security is the subject of much debate, partly due to the difficulty of defining it.

Food insecurity as experienced in other locations is likely to be somewhat different but will include similar components that go beyond availability and access. Generally speaking, in-depth understanding of food security is crucial for developing valid measures, for two reasons. First, for a measure to be valid, its construction must be well grounded in an understanding of the phenomenon. Second, in-depth understanding can be used as the basis for creating a definitive criterion against which a developed measure can be compared.

Although its most extreme manifestations are often obvious, many other households facing constraints in their access to food are less indefinable. Because the interventions vary depending on the context, the appropriate way to capture their impact on the determinants (common set of indicators) of household food access is problematic. In addition to the challenges posed by the range of activities implemented, data for many indicators used to measure the determinants of household food access, such as income and expenditure, are expensive and technically demanding to collect and analyze (Ibdi, 2006).

Collection of valid and reliable data for a complete analysis of food security can also be an almost impossible task in situations where the term “household” itself is subject to varying interpretations and composition, where household member are reluctant to reveal to each other the full extent of their individual earning power or assert through each adult member may have multiple income sources where responsibility for the production and /or purchase of food is shared among these adult members and

finally where subsistence production is harvested from time to time and thus neither measured nor recorded.

Be that as it may, several studies in the Ethiopian set have revealed the magnitude of the food insecurity in the country and the factors that positively influence household food security. As a result, a study by Mulugeta Tefera indicated that about 71.8% of sample farmers in Boke district of Western Hararghe Zone were food insecure among the 14 explanatory variables included in the logistic regression model, 8 were found to be significant at less than 10% probability level as having influence in food security. These were family size, number of oxen owned, use of fertilizer, food expenditure pattern, number of livestock owned, size of cultivated land, off- farm income and income per adult equivalent (Mulugeta T., 2002).

Similarly, a study carried out by Abebaw Shimeles in Dire Dawa using a binary logit model revealed that around 75.7% of a sample household in the study area was food insecure. According to this study, nine out of the thirteen explanatory variables were found to be statistically significant as their influence on food security. The variables were family size, annual income, amount of credit received, irrigation use, and age of household head, status of education, cultivated land size, livestock ownership and number of oxen owned (Abebaw S., 2003).

Likewise, a study in Tanzania shows that household food security is positively influenced by total household asset disposal and income (Ashimogs, 2000 cited in Mulugeta, 2002). The study revealed that household with more land and cultivated plots, higher literacy status of the head, ownership of oxen and farming tools, young farmers and those with few dependents were found to be more food secure than others (Bekele E, 2000). Generally speaking, the following were selected regressors variables which were hypothesized to have association with food security based on available literatures mentioned here above.

(1). **Age of the household head** : It was also hypothesized that the age of household head and food security are positively correlated for the reason that the older the household head, the more experience he/she has in farming and weather forecasting. On top of this, they are risk averter & therefore, tend to intensify and diversify their production activities.

(2). **Sex of HH head :** It was hypothesized that male-headed households are more likely to be food secure for the reason that lack of labor in female headed households forced them to rent their land.

(3). **Family Size (AE):** It refers to the size of household members converted in adult equivalent. Conversion table is in the appendix 4. It was expected that family size and food security status are

negatively related for the very reason that the existence of large family could raise demand for food with limited food supply.

(4). **Level of education:** According to various literatures education level was expected to have positive impact on food security for it equips individuals with necessary knowledge of how to make living.

(5).**Size of cultivated land:** This variable represents the total cultivated land size of a household in hectare. It was hypothesized that farmers who have larger cultivated land are more likely to be food secure than those with smaller area provided that the land is similar in its production potential and technology applied.

(6).**Livestock holding (TLU):** It refers to the number of the total number of livestock holding of the farmer measured in tropical livestock unit (TLU). Literatures indicate that higher possession of livestock increases the probability of households to be food secure.

These literatures have also shown the association of each and every variable (off-farm income, credit services, and access to various services, asset possession and the like) with food security based on certain justifications.

2.7. Evolution of Resettlement in Ethiopia

Resettlement in Ethiopia has a relatively long history. State sponsored population resettlement in the country was introduced starting the Emperor's era with the establishment of the Ministry of Land Reform and Administration in 1966.

To further strengthen the importance of resettlement as a means of redistributing population and developing less populated areas, the Third Five-year Development Plan introduced in 1968 also gave a special focus to it (Pankhrust, 1992; Rahamot, 2003).The type of settler in this case included urban unemployed, pastoralist, ex-soldier and famine victims.

Later, during the Dergue government; resettlement was carried out in two phases. The first phase was during the first decade of the Dergue's rule (1974-1983). In that period, the government resettled some 46,000 households in 88 sites in 11 administrative regions (Pankhrust and Pinguet, 2004). The second phase was post the 1984 famine when over half a million people were moved from the drought prone north-eastern parts of the country and resettled in the West and South-west parts (Pankhrust and Pinguet, 2004). Most of the people earmarked for settlement in this case were famine victims.

The current Ethiopian government has also considered resettlement as one strategy to overcome or at least reduce the persistent problem of food insecurity and ease the pressure on land in the densely populated highlands. That is, the government considers it as the economical and most viable solution to the problem of food insecurity on basis of the availability of land in receiving area, the labor force of the resettlers, and easing pressure of space for those remaining behind.

With such strategy, it was planned to resettle about 440,000 households (2.2 million people) inter-regionally in Tigray, Amhara, Oromiya and SNNP regional states over the period of 2002/03 to 2005/06 (CFS, 2003 cited in Feleke, 2004). In 2003/04, a total of 9,345 households were moved from Sidama, Kembata-Tembaro, Welayita, Hadiya and Gedeo Zones, and Konso Special Woreda (District) and re-settled in Bench-Maji, Keffa, Dawro, Sheka and South Omo Zones, and Basketo Special Woreda. About 13,108 households were also planned to be resettled in the year 2004/05 (World Food Program resettlement map).

Since 2003, the FDRE Government resettled over 164732 households in the four regional states (FDRE, 2006). About 45,000 of these households have been resettled in the western lowlands of Tigray and Amhara regional states until 2005 (TRGBRD, 2003).

According to the program, resettlement is based on voluntarism, availability of underutilized land, consultation with host communities, and proper preparation (the four pillars of resettlement program). It is also argue that the current resettlement is implemented in accordance to ethnic, language, and cultural similarities within the Regional States. Each settler household is guaranteed assistance of packages that include provision of up to 2 hectares of fertile land, seed, oxen, hand tools, utensils, and food ration for the first eight months. The settlers are also provided with access to essential social infrastructures (clean water, health, health post, feeder road) and logistics support (FDRE, 2006).

2.8. Debates on the Effectiveness of Resettlement Program to Food Security Attainment

Resettlement in Ethiopia, especially the one that took place during the dergue regime, has been subject to condemnations for it has claimed the life and desertion of thousands of people.

The current government resettlement initiative was also criticized for not implementing the promises made (material and financial support) to resettlers prior to their being relocated. The government has been involved in the construction of infrastructure facilities such as roads, schools, health posts and veterinary service for livestock.

Regarding the failure of achieving the planned objective in certain resettlement area, it is argued that the program is characterized by hasty planning and practice resulting in poor sites selection, poor targeting of potential settlers, other ambitious principles, poor consultation, poor preparation and poor regard for the host community and the physical environment in the site (Dessalegn W., 2003 cited in FFSS, 2005).

Referrals (those were sent to visit the sites to settling) give positive testimonies which led to a great disappointment became a major factor for departure from the site when circumstance did not correspond to expectation. There was also lack of follow up of the progress of settlers.

A survey on comparison of residing in new area (resettlement area) and in old habitat showed that while new area has better service such as health service, illnesses are more frequent in new areas of settlement than in their home areas of origin. Majority of settlers also reported that access to food was better before resettlement. This shows that resettlement as a solution for food self-sufficiency and food security is questionable (FFSS, 2005). Some studies (for example, FFSS, 2005) suggest that the 2003 and 2004 resettlements increased impoverishment risks to locals and to the earlier settlers by increasing landlessness, tensions and conflict.

Furthermore, it has been argued that though more than half a million people have been resettled since 2003 in four regions, little is known about key issues, such as site selection and preparation, selection of the settling families, the food security situation, adaptation of the resettlers with the local people, sustainability of the resettlement program and impact on the environment (FFSS, 2005).

According to the study, neither did promise to provide the new-comer with 2 hectares of farmland materialized until the resettlers had to clear their plots on their own, nor contrary to what has been set out in the Resettlement Implementation Manual (RIM), forest and wildlife resources were protected.

- Assefa (2005) has reported that there were heavy losses of natural resource, particularly in the forest area which have been already under fragile conditions due to continuous clearing for firewood, charcoal, house construction etc. (Assefa, 2005 cited in FFSS, 2005).

On the basis of past resettlement related research findings, the success of the program in terms of food security is viewed in a contentious or skeptical way. Authorities usually focus on food self reliance where as for example, Pankhurst (2005) points out that the settlers mention not only the amount but also the

quality and the type of food, and stress the need for cash for other basic necessities. Nevertheless, according to Pankhurst, despite disputes in the successful households producing a wider range of crops, such as maize and sesame, the later being used for cash generation which enables farmers to purchase animal power, sheep, goats and poultry to improve their livelihoods.

The general survey made in the Humera area also revealed that the settlers were able to engage in off-farm income activities by clearing the land, weeding and harvesting in the private fields of richer farmer as well as working as guards, petty trade such as the owning and operating of small shop, teahouse, restaurants, and mills. The selling of 'tella' (local beer) in the house and renting out rooms, sell of handcraft products, honey collection are used as sources of extra income . But, lack of initial capital, technical training and prior experience has been reported as negative effects on income diversification in certain cases (Kelemwork, 2008).

Generally speaking, a survey made in Humera indicates that resettlement has fulfilled basic necessities that were either extremely scarce or totally inaccessible during the pre-settlements period;

- enough food
- better clothing
- foot-wears
- have crucial utensils
- having some cash to be spent on detergents and to be employed for entertainment purpose such as the purchase of beer for example, instead of Tella and Arki in pre- resettlement period.
- those who did not have animals owned a few
- those who had a few added more heads of livestock as their decision to resettle.

Pankhurst related partial achievement resettlement program to some resettlers who brought cash with them or were obtaining income from production in their home areas invested such income in the resettlement areas and became very successful in a short period of time. Some resettlers obtained more land through share-cropping, hiring labour, producing cash crops and involve in trade. Some settlers were able to construct houses with iron roofs and purchase more and better household and consumer goods, even have hired tractor services and grinding mills (Pankhurst, 2005 cited in FFSS, 2005).

Surveys made in some sites also reinforce the idea that resettlement as a rehabilitation scheme, longer term of resettlement as a development strategy enables to improve the well being and good life which includes being able to buy livestock, clothing, house hold equipment, construct better houses, cultivating

more land and becoming involved in cash crop production and trade in agriculture, irrigation and off-farm activities.

This general survey recognized:

- advantages to the host communities in the form of better administration services such as schools, clinics, water and electric supply as a result of resettlement program.
- moreover, resettlement has given host communities an opportunity to develop a spirit of competition in earning strategies and improved access to markets to the availability of infrastructure which was not there before the advent of the relocates. Members of host communities also have learned new farming system and practices from settlers while the settlers also have gained animal husbandry skills from the host population.

Regarding innate success endowment, Panhurst (2005) described that unsuccessful settlers included those not motivated to stay in resettlements areas, unable to get access to education or job characterized by laziness and thereby produced much less, had problem of drink were food insecure, had few or no livestock, and poor social capital. These unsuccessful groups also exhibited female-headed households, the elderly, weak, disabled and people suffering from malaria and other diseases.

Regarding the effect of resettlement on environment, Assefa (2005) gives detailed explanation as; Settlers cut and cleared woody vegetation indiscriminately for various purpose (housing, farming implements, furniture, and the like). Besides clearing woody vegetation for individual use, as construction materials and form implements, those who use tractor had to get ride of most of the trees from their farmland because such trees and their roots rendered ploughing by tractor difficulty. This state of affairs is in contrast to the beliefs and practices of the host community who believe that loss of trees in farmland causes drastic deterioration of soil fertility because the farm land is robbed of tree leaves that decomposed to organic components of the soil. The setters, on the other hand, feel that trees in a farm land reduce crop production due to their shading effect and the heavy rain drops from their branches. Deforestation in the settled areas has been attributed to expansion of agricultural activities, increase wood consumption for fuel, construction, farm implements and furniture.

Some consequences of the follow up

- Illegal expansion of farmlands and unwise utilization of grazing and woodlands
- Opportunistic farming by settlers who never heed proper land management procedure
- Introduction of illegal cultivation within the reserve area

- Illegal wood export to the Sudan for example (in the case of Kafta Humera settlers),
- Excessive use of woods biomass for fuel purpose, production of charcoal and local furniture, both for personal use and for sale (Assefa, 2005 cited in FFSS, 2005).

Chapter Three

3. Material and Methods

3.1. Description of the study area

Location. Kafta Humera is one of the 36 woredas in the Tigray Regional State of Ethiopia. It is situated in the Western Zone of Tigray. In its absolute location, it is situated between $13^0$40' N and $14^0$27'N, and between $36^0$27'E and $37^0$32'E.

Kafta Humera covers approximately 717,657 ha. It stretches from Rawsa river in the south to Tekeze river in the north (Eritrean border) and from Wolkayt Woreda in the east to the Sudan border in the west (Figure 3.1). Humera town is the capital of both the Western zone of Tigray and the 'kafta' Humera Woreda.

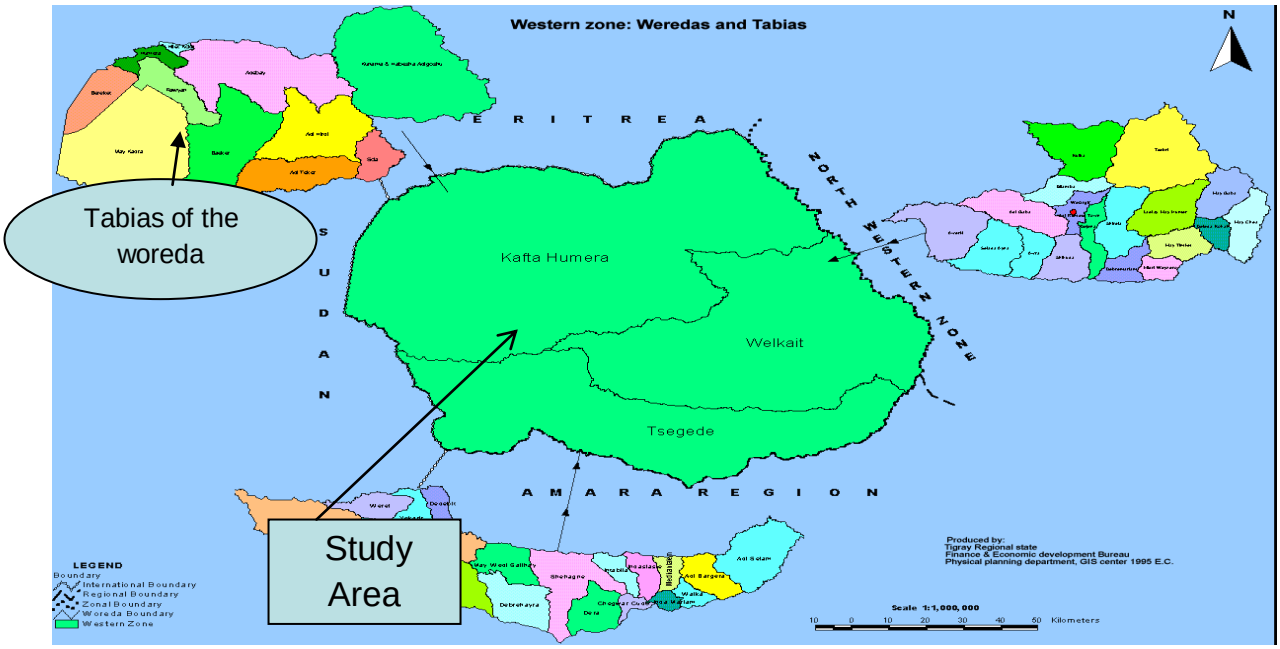


Figure 3.1: Location Map of the study area.

Climate. As per the traditional climatic zone classification of geographical regions of Ethiopia, Kafta Humera woreda can be roughly divided into two zones (Hurni, 1986) ; "Woina Dega" with an altitude of 1500-2300 masl and mean annual rainfall of 1102.5 mm (5 years record; 1993-1997) and "Kola" with an altitude of 500-1500 masl and mean annual rainfall of 581.2mm (3 years record; 1994-1996). Most of the rain occurs between June and September. The mean annual temperature is about 28.5 ^{0}C while the mean annual maximum and mean annual minimum temperatures are around 37.6 ^{0}C and 20.2 ^{0}C respectively (Haileslassie, 1998).

There is a trend whereby mean annual rainfall increases from west to southwest from 448.8 mm at the northern part to 1102.5 mm at the southern part at Banat and the highlands of Kafta. It has unimodal rainfall pattern with 80 to 85% of the rain falling in the summer; in June, July and August (as an example, see Figure 3.2; rainfall distribution at Humera station). About 78% (553,768 ha) of Kafta Humera woreda is Kola or low land with temperature ranging from 40 to 45^{0}C (BoFED, 2008).

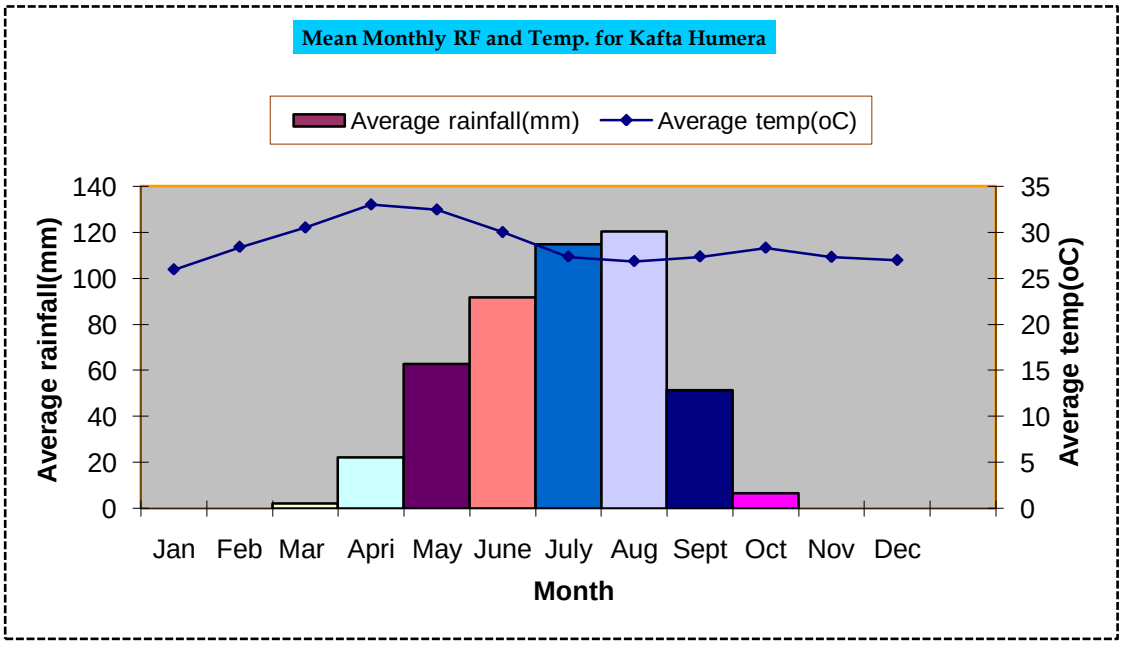


Figure 3.2: Mean monthly rainfall and temperature of Humera station (data: BoFED, 2008).

Physiography. Altitudinally, Kafta Humera ranges from approximately 560 m amsl in the Tekeze river (near to the Sudan) in the north to 1849m amsl in the Bil-amba (around Medacha) in the south. The area consists of a heterogeneous landforms composed of flat plains, undulating, rolling plains, isolated hills, chain of mountain, valleys and gorges (Hailesilassie, 1998).

Soils. In Kafta Humera woreda, the dominant soil is vertisols. Other soils include acrisols, luvisols, cambisols, ferralsols, fluvisols and leptosols (TBoNRDEP, 1998) .The study area consists of a vast fertile-plain lands and the vegetation cover is better compared to other parts of Tigray (ibdi, 1998).

Socio-economic. Kafta Humera woreda has an estimated total population of 92,144 with 4.4 average household sizes (CSA, 2008). Out of the total population; 50,139 are men and 42,005 are women. About 62.3% of the woreda population is rural occupant. Children (under age of 15) dependency ratio for the woreda is 84 whilst old age dependency ratio is 9 (Bureau of Kafta Humera woreda, 2009). Average crude density of the woreda is about 13 persons per square kilometer, i.e.; [(717,657 ha = 7176.57 Km2)/ 92,144 people].

The main economic activity of the study area is agriculture: rain fed crop cultivation and livestock herding. Livestock herding is practiced on traditional free grazing system. Sorghum is the main crop cultivated in all Tabias and followed by sesame. The other crops grown in the wereda are cotton, teff, millet and chick pea. Sorghum is cereal crop for domestic consumption, whilst sesame and cotton are for market as a source of cash for the household.

3.2. Study site selection

The study area (Tabias) has been selected through multi-stage/area sampling technique. Tigray has been chosen by the researcher for obvious reason that it is the closest area where two resettlement sites of Ethiopia are situated. In Tigray, there are six zonal administrative regions: the Southern, the Central, the Eastern, the Western, North western, and one urban zone around the regional capital of Mekelle. It is in the Western zone that the resettlement takes place. In this zone there are two woredas (Kafta Humer and Tsegede) where large number of resettlement has been undertaken. From these two woredas, Kafta Humera was purposefully selected. The selection of this wereda has been justified, firstly, by the fact that large numbers of people who have been originated from many other woredas of the region were made to resettle in this area. Secondly, it is a resettlement site where both institutional and physical infrastructures are assumed to be well established and easily accessible to the researcher.

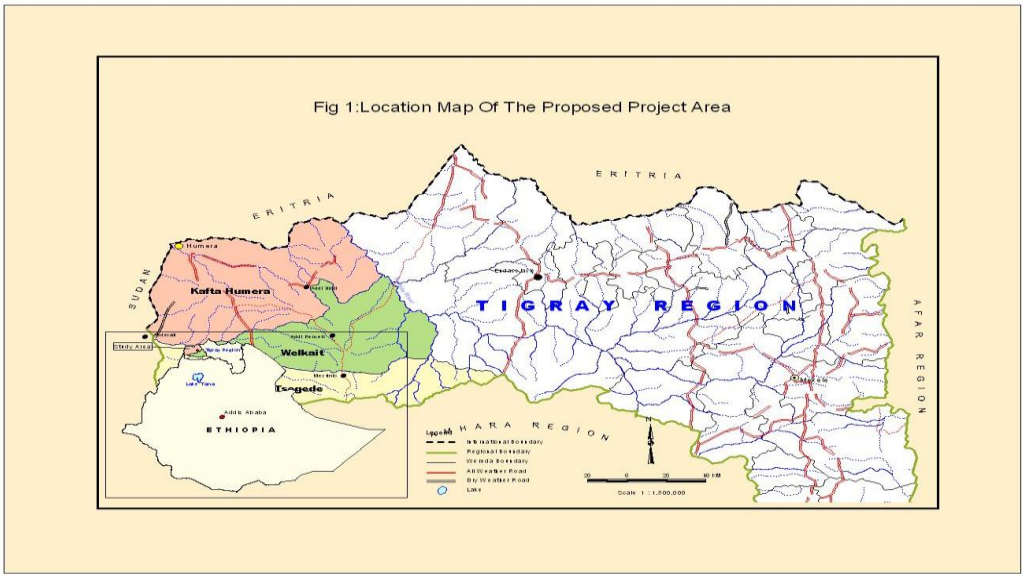


Figure 3.3: Tigray Zonal administration

Source: BoFED, GIS Division 2008

In this woreda, the number of people to resettle with in a tabia has been specified. When more people come to settle in the woreda, new *Tabias* have been opened. Thus, prior to 2003, 11 Tabias have been evolved. Since 2005, the Tabias increased to 20 because of the arrival of many new resettlers into the woreda.

Until October 2005, about 30,000 people have been resettled in 11 Tabias of the woreda through a voluntary resettlement program (personal communication with woreda officer). Some of these resettled in two of the old eleven tabias. Others were resettled in newly established nine tabias of the woreda. From these Tabias, Maiwoini and Hagere Selam have been selected.

The researcher has, therefore, purposefully selected two tabias out of the above 11 Tabias for the following reasons.

I. The researcher has chosen the household groups who resettled since 2003.Otherwise; the researcher believes that treating only late settler will pose serious difficulty, especially in determining the extent to which the resettlement program has brought about socio-economic improvements. That is, treating resettlers since 2003 will be helpful in knowing the extent and differential factors for being food secured

among households. Besides, the more time, for instance resettlers have been in the area, the more vividly improvements or otherwise can be observed.

II. The selection requirement was also based on size of original resettlers in each tabias of the Woreda. In view of this, Hagereselam was purposefully picked. This tabia was also thought to be representative to the weinadega agro-climate conditions of the woreda.

III. Since the other objective of the paper is addressing the impact of resettlement on environment, taking at least one tabia which is located within large forest wild life reserve area could help the researcher to show consequence of resettlement on environment. Maywoini (Giyise) is accordingly selected from among tabias situated in the low land and Kolla part of the Woreda. Besides, the selection of this tabia would be representative to Kolla traditional agro ecological zones of the Woreda.

IV. Lastly, as the research task was privately financed, the researcher has decided to choose the nearest tabia from the already selected sites.

3.3 Household sample selection and composition

After a clear delimitation of the study sites, 98 sample households have been selected from the total household of 7,278 of Maiwoini and Hagere Selam Tabias of Kafta Humera woreda. The sample size has been determined using equation 1 with a 95% level of confidence, 0.5 degree of variability and 0.1 margin of error (e) (Yemane, 1967 cited in Alene, M., 2008).

$$n = \frac{N}{1 + N(e)^2} \qquad \textbf{(1)}$$

Where,

n : sample size,

N : population size

e : level of precision

A total of 98 respondents have been selected from the two Tabias using a proportional random sampling technique. Through this technique 44 and 47 households (samples) have been selected respectively from Maiwoini and Hagere Selam Tabias.

The administrative members of the two tabias of concern, namely: tabia chair person, tabia administrator/manager and the head of the agricultural and rural development office of the tabia were contacted for detail discussions on the status of resettled households on food security vis-à-vis environment based on the check list of questions directed to them. Moreover, 92 residents (almost equal from each tabia selected decisively) of the tabias under consideration were also approached for discussions on the questionnaire directed to the settlers of the respective tabias.

As the respondents (i.e. resident respondents) were selected at random they are considered as typical representatives of the areas of concern in terms of gender, age, and number of households. Table 4.5 present the composition of respondents. Households in Kafta Humera have average family size of 4.4 persons per households. The total family member of the sample was 365. It comprises of 15% female and 85% male.

Table 3.1. Composition of respondents

Tabias	Sex			Age		No. of household members (Adult Equiv.)		
	F	M	Total	15-64	>64	1-3	4-6	7-8
Mai-woini	11	36	47	46	1	38	7	2
Hagere-selam	4	40	44	43	1	27	15	1
Total	15	76	91	89	2	65	26	3

3.4. Type and sources of data

Both primary and secondary data were used in the analysis. The primary data was collected using a structured questionnaire, group discussions, and key informants. The questionnaire was used to get primary data on household characteristics, place of origin of re-settlers, level of crop and livestock production, household income and sources, household consumption (used to compute AHFSI), agricultural input and output, marketing, natural resource use in production and consumption, weight of

resettlers and other data sets directly related to a specific household's livelihood and household food security status.

Six enumerators, who understood Tigrigna have been trained for a day on the content and method of data collection. The researcher was the only one, who administered, supervised the overall survey enumerators. Required data have been collected in October and November 2009.

Group and individual discussions have been made on a check list of questions incorporating what economic and environmental conditions were like before the re-settlement, what changes have occurred since the resettlement period. Personal observation of the conditions of the farmlands and activities being carried out in the area of interest was made. Furthermore, focus group discussions were held intensively and extensively to get the opinions of the various stakeholders in the program and its development. The following individuals and /or offices with their respective areas information domain were involved, one way or another, as the sources of information for the research work.

i. Woreda administration, woreda agricultural and rural development, and woreda environmental protection and land use administration officers were approached for general discussions on an understanding of the study under discussion.
ii. Discussions on the basis of a questionnaire directed to the Woreda Administration Chairman were undertaken and the concerned authorities had forwarded their views and judgments on the matter at issue.

Here information from the key informants selected from the host community helps to indicate how the natural resources had been used before the resettlement and what changes have been seen since the beginning of the resettlement program. Through group discussions, the forest or woodland coverage before the resettlement and changes since the resettlement was operated was used to investigate the trends in natural vegetation changes, which can be used to project long term impacts of the resettlement on environment.

Furthermore, secondary data obtained from various publications such as books, articles and pamphlets as well as newspapers and unpublished documents were used to enrich the findings from interview and empirical observations from the field.

The aggregate household food security index (AHFSI) was constructed using both primary and secondary data.

To determine the status of health in the area under consideration, the prevalent leading diseases in the area and the level of settlers' awareness with regard to the respective disease types have been analyzed using secondary data.

3.5 Data Analysis

All collected data have been systematically organized, coded, edited and entered in spread sheets of STATA and Statistical Packages for Social Sciences (SPSS) for analysis. Descriptive and inferential statistics have been used to analyze the collected data. In descriptive statistics; cross tabulation, averages, percentages, standard deviation, coefficient of variation, aggregate household food security index (AHFSI) and Gini-coefficient have been used. Along with these descriptive statistics, data have been displayed in graphic presentation. In inferential statistics; t-tests (one sample t-test, two independent t-test and paired t-test) and Chi-square (X^2) test have been used. Lastly, the data that have been analyzed in descriptive and inferential statistics have been used in application of logit model.

3.6. Variables and analytical methods

3.6.1. Measuring food self-sufficiency & food security

Food self-sufficiency and food security status of the resettlers have been measured and analyzed using aggregate household food security index (AHFSI) and food balance sheet (Ramakishan and Demeke, 2002).

Aggregate Household Food Security Index (AHFSI) was used to measure the household level of food security. The AHFSI includes all the three elements of the FAO's concept of food security**:** availability, stability of food supplies and access to food. It combines the indicators of per capita food availability for human consumption (dietary energy supply in kilo calories), and information on the distribution of available. Thus, aggregate household food security index (AHFSI) is measured by:

AHFSI = 100-[H {G+ (1-G) I^{p}} +.5 Ω {1-H [G-(1-G) $I^{p]}$} 100 (FAO, 1998) (***2)***

Where,

H **:** is head-count of the population of the sample population undernourished, which is equivalent to body mass index (BMI).

G **:** is a measure of the extent of food gap of the average undernourished (shortfall in dietary energy supplies from national average requirement). National average requirements were considered to be equal to 1.

IP **:** is a measure of inequality in the distribution of individual food gaps of the undernourished, which is equivalent to Gini-coefficient (GC).

Ω **:** is the coefficient of variation in dietary energy supplies, which gives the probability of facing temporary food shortage.

Head-count of the population of the sample population undernourished (H = BMI) is calculated by:

$$H = BMI = \frac{W}{H^2} \quad \textbf{(3)}$$

Where,

W : weight measured in kilograms

H : height measured in meter

(Using standardized height measurement)

BMI can take values between 15 and 40. For this purpose, following classification has been proposed by FAO (1997):

Below 16**:** severe chronic malnutrition

16-17.5**:** chronic malnutrition with wasting

17-18.5**:** chronic malnutrition with underweight

18.5-25**:** Normal

25-30**:** Overweight

Over 30**:** Obese

Thus, the people having index less than 18.5 were considered undernourished.

A measure of the extent of food gap of the average undernourished (G) is calculated by:

$G =$ Mc-Ac or Mc/Ac **(4)**

Where,

Mc : is the required minimum kcal.

Ac : is actual average kcal for undernourished.

$$IP = GC = \frac{Area\ between\ \ line\ \ of\ \ equality\ \ \&\ Lorenz\ \ Curve}{Total\ area\ \ under\ \ the\ \ line\ of\ \ equality\ \ (a\ \ trainagle\ area)} \quad \textbf{(5a)}$$

Or

$$IP = GC = \frac{1}{100}[(X_1 * Y_2 + X_2 * Y_3 + ... + X_{n-1} * Y_n) - (X_2 * Y_1 + X_3 * Y_2 + ... + X_n * Y_{n-1})] \quad \textbf{(5b)}$$

Where,

$X_{1,2,3...n}$: is cumulative Lorenz value of X

$Y_{1,2,3...n}$: is cumulative Lorenz value of Y

Cumulative Lorenz value of X_1, X_2, $X_{3\ldots}$ X_n are calculated by

$$X_1 = \frac{X_1}{\sum X} * 100,\ X_2 = \frac{X_1 + X_2}{\sum X} * 100, \ldots\ X_n = \frac{\sum X}{\sum X} * 100 \qquad \textbf{(6)}$$

Cumulative Lorenz value of Y_1, Y_2, $Y_{3\ldots}$ Y_n are also calculated in similar fashion.

To draw the Lorenz Curve, the calories availability to the sample individuals were arranged in ascending order and percentiles were made. The total calories availability to the individuals was calculated and percentage availability of calories to every percentile was determined. The percentiles of population and calories availability in cumulative percentages were used to construct the Lorenz Curve. The percentages of the population were plotted on horizontal axis and percentage of food availability in calories was plotted at vertical axis. The entire figure was enclosed in a square and a diagonal line was drawn from the lower left corner of the square to the upper right corner.

That diagonal line acted as line of equality. To put it differently, it is the ratio of the area between the Lorenz curve and the 45^0 diagonal lines to the area of the triangle below the 45^0.

So as to compute irregular area (i.e., between line of equality (diagonal line) and Lorenz curve), the researcher first divided it into regular rectangles and triangles. The areas were computed with the following equation: A= $\sqrt{s(s-a)(s-b)(s-c)}$

Percentage coefficient of variation in dietary energy supplies, which gives the probability of facing temporary food shortage ($\Omega = CV$) is calculated by:

$$CV = \frac{s}{\overline{X}} * 100 \qquad \textbf{(7)}$$

Where,

s : is standard deviation of a variable under consideration

$\overline{X}$: is arithmetic mean of a given variable under consideration

Standard deviation (s) is calculated by:

$$s = \sqrt{\frac{\sum\left[x - \bar{x}\right]^2}{n}} \quad \textbf{(8)}$$

So, the values of four variables of AHFSI were calculated and by inserting these values into the model, the AHFSI was calculated.

The value of AHFSI ranges from 100, which represent complete risk-free, and food security to 0, which represents total famine.

AHFSI of less than 65 stands a critical level of food security, between 65 and 75 is categorized as low, between 75 and 85 is medium and over 85 represents a high food security level (FAO,1997).

3.6.2. Inferential statistics

In attempt to determine whether a mean of a sample is significantly different from some criterion values the researcher perform; i) one-sample t-test, ii) two –sample t-test and iii) paired sample t-test and iv) Chi-square test (X^2).

i) Test of one sample mean against population/hypothesized mean

The *one-sample t-test* tests a hypothesis by comparing a sample mean ($\overline{X}$) with a hypothesized mean or population mean (**μ**). In this case the upper and lower critical limits should be identified from the t-distribution at the 0.05 level of significance with n-1 degree of freedom. The one-sample t-test, t-value of the sample (t_{obs}) is calculated by:

$$t_{obs} = \frac{\overline{X} - \mu}{S_{\overline{X}}} \quad \textbf{(10)}$$

The standard error of the mean ($S_{\overline{X}}$) is computed by:

$$S_{\bar{X}} = \frac{s}{\sqrt{n}} \quad \textbf{(11)}$$

In this case, if observed (calculated) t lies outside of the lower or upper critical limits the Ho that states the sample and hypothesized means are equal would be rejected.

ii) Test of the difference between two independent means

To answer the question that states "*is the difference between the means of the determinants of food secure and insecure statistically significant?"* For this test, a t-test for difference of means (t-test for comparing two means) has been used. The t-test for comparing two means has been computed by:

$$t = \frac{\bar{X}1 - \bar{X}2}{S_{\bar{X}1\bar{X}2}} \quad \text{(Zikmund, 2000)} \quad \textbf{(12)}$$

Where,

$\bar{X}1$: is mean for group 1

$\bar{X}2$: is mean for group 2

$S_{\bar{X}1\bar{X}2}$: is pooled or combined standard error of difference between means

Pooled or combined standard error of difference between means ( ) is calculated by: $S_{\bar{X}1\bar{X}2}$

$$S_{\bar{X}1\bar{X}2} = \sqrt{\left(\frac{(n1-1)s1^2 + (n2-1)s2^2}{n1+n2-2}\right)\left(\frac{1}{n1}+\frac{1}{n2}\right)} \quad \text{(Zikmund, 2000)} \qquad \textbf{(13)}$$

Where,

$s1^2$: is the variance of group 1

$s2^2$: is the variance of group 2

$n1$: is sample size of group 1

$n2$: is sample size of group 2

In test of two means, degrees of freedom (df) are calculated as df = n-k; where n = n1+n2 and k = numbers of groups.

iii) Paired t-test

The *paired-sample t test* is used to compare the means of two variables within a single group. In this study, an attempt has been made to examine average variation on asset ownership (holding) between the resettlers before and after resettlement, (i.e. if there is statically significance difference in livestock ownership). The null hypothesis (Ho) states that there is no significance difference between before and after resettled households in terms of livestock ownership[1]. The equation that has been used for test of the difference between two independent means (equ. 12 and 13) has been also used in this test except pre-tests between groups.

iv) Contingency X^2-Test:

[1] The number of livestock owned by a household will be measured in tropical livestock unit (TLU).This is commonly taken to be an animal of 250 KG live weight .(TLU Conversion used :1 TLU=1Cattle =1 horse=6.67 sheep= 6.67 goats=0.87 mule =1.54 donkeys=0.69 camel =200 poultry (Ramakrishna and Demeke (2002).

The difference between female and male head household food security difference has been tested by contingency X^2-Test.

$$\chi^2 = \sum \frac{(O_i - \mathrm{E}_i)^2}{\mathrm{E}_i} \qquad (14)$$

Where,

χ^2 : Chi-square statistics

O_i : observed frequency in the i^{th} cell

E_i : expected frequency in the i^{th} cell

Expected frequency of cell i of the contingency table (E_i) can be calculated by:

$$E_{rici} = \frac{\sum ri * \sum Ci}{N}$$

Where,

E_{rici} : Expected frequency of cell of "row i" and "column i".

$\sum ri$: sum of row i

$\sum ci$: sum of column i

N : Total number of frequencies of both male and female- headed households.

3.6.3. Determinants of Food Security

From among commonly used approaches in estimating dummy dependent variables ('Yes' or 'No' type) regression are logit and probit. Both models guarantee that the

estimated probabilities will lie between logical limit 0 & 1. For this very reason, the models are frequently used when dependent variables are found to be dichotomous (Gujarati, 1995).

The two models are actually quite similar except some differences. It was asserted that the models yield estimated choice probabilities that only differ by less than 0.02. In addition it is advantageous over probit not only because the predicted probabilities are easily arrived but it is also preferred for observation at the extremes of distributions. For this very reason this research work applied logit model to elicit the factors influencing food security among the resettled households. It employed food security status among the households as the dichotomous dependent variable. That is, 1 for food secure and 0 for food insecure household. The binary logistic regression models were employed to address the objectives of the survey. Below are some of the basic variables and working hypotheses that are supposed to influence food security status of the resettled households in the study area.

The dependent variable of the model is discrete variables that represent the status of resettled households on food security.

Here, the minimum food calorie needed to ensure survival per adult equivalent per day was used to classify resettled households into two groups. In this model, the dependent variable takes a value of 0 if the household belongs to below the calorie requirement, i.e. insecure with the probability of Pi, otherwise a value of 1, i.e. secure with the probability of 1-Pi .Specification of the model is as follow

Logit (secured) = ln p/1-p = a +bixi +u

p = probability of being food secure

1-p = probability of being food insecure

$P_i=1/1+\mathbf{e}^{-L}$

$$LogitY1 = \alpha + \beta 1X1 + \beta 2X2 + \beta 3X3 + ... + \beta nXn + \varepsilon$$

Where,

Pi :is 1 the probability that the household is secure; 0 otherwise.

Xi :is explanatory variables were chosen based up on available related literatures on the subject at issue. Such variables include**:** initial capital , age of household head, Household size, Land size (per capita), Education level of household , Dependency ratio, Year of resettlements of household head, Size of livestock, irrigation use, on farm/off farm income, household asset, marital Status, fertilizer use ,soil Type, travel frequency, average distance to farmland.

βi's :is parameter estimates for independent variables (Xi's),

e : Error term

The probability that the household belongs to insecure will be (1-Pi).

Y_1**=Being food secured**

X1= Age of household head

X2=Fertilizer use

X3=Household size

X4=Land size

X5=Education level of household

X6=Dependency ratio

X7=Soil Type

X8=Sex of household head

X9=Average Travel Frequency

X10=Initial income

X11=Off-farm income

X12=Household Asset

X13= Size of livestock (TLU)

X14=Tabia

X15=Credit service

Bi's=Parameter estimates for independent variables (Xi's), €=Error ter

Chapter Four

4. Results and Discussions

4.1. An Overview on Some of Resource Endowment of the Study area and Characterization of the Socio-economic Condition of Resettlers

4.1.1. An overview on some of resource endowments

The general objective of this research work was to critically assess the impact of the resettlement program on the livelihood of resettlers on the one hand and on the environment (forest degradation) on the other hand, in the Kafta Humera Woreda of Tigray. As a back-up information for treatment of this objective, an overview of resource endowment of Kafta Humera Woreda has been given hereunder.

Until 2005, about 16,632 households have been resettled in the Kafta Humera Woreda, while the resettled total population in Mai-woini and Hagere-selam were 11,177 with 3,334 households. Each household was provided with, on average, 300m^2 (15x20m^2) of land for homestead and in principle a minimum of 2 hectares of land for farming (WARD, 2008). In Mai-woini, 52.74 and 3516 ha of land have been used for homestead and farmland respectively, and in Hagere-selam, 48.09 and 3156 ha of land have been used for homestead and farming respectively (Table 4.1). From key informant discussion, it has been learnt that all land size indicated in Table 4.1 was classified as semi-forested land (partly forest and partly cultivated).

Table 4.1: Resettled households, total population and area for homestead and farming land in Mai-woini and Hagere-selam Tabias (source: TAAA, 2009).

Resettlement Tabia	**Household heads**			**Total population**			**Allotted land**		
	M	F	Total	M	F	Total	Homestead (ha)	Farm land (ha)	
Mai-waini	1406	325	1731	2564	1768	4332	52.74	3516	
Hagere-selam	1450	153	1603	3895	2950	6845	48.09	3156	
Total	**2856**	**478**	**3334**	**6459**	**4718**	**11177**	**100.96**	**6672**	

Out of the total area of the woreda, about 240,000 ha was covered with forestry, about 396,850 ha was cultivated, about 36,800 ha was grazing and 44,000 ha is maintained for various purposes (WARD, 2008).

As the area deployed for farmlands was mainly covered with forestry; 6 of the 11 Tabias were fully covered with forestry 3 Tabias were partially covered with forestry while only 2 Tabias were fully under farmland. After the resettlement program, however, a shift in land use has been introduced and more land has been converted into cultivation, livestock grazing and settlement areas. Furthermore, investment on large commercial farms with an area of 116,303 ha is taking place in five Tabias of the woreda.

The resettlement Tabias under discussion has good number of livestock (Table 4.2).

Table 4.2: Livestock Population in Mai-woini and Hagere-selam Tabias (Source: TAAA, 2009)

Tabias	**Types and population of Livestock**				
	Cattle	Goats & sheep	Donkeys & camels	Poultry	Bee colonies
Mai-waini	11,755	5022	747	6743	100
Hagere-selam	4282	5447	975	5204	-
Total	**16,037**	**10,469**	**1,722**	**11,947**	**100**

Cattle are reared for agricultural purposes, for the production of milk and meat for both domestic consumption and sales. Likewise, goats and sheep are reared for their meat while donkeys and camels are used for plowing and for transportation purposes.

In general, resettlers practiced mixed farming. The livelihood of the animal husbandry practice wholly rests on the natural provision of the different grass species and bushes for browsing and grazing .The main sources of water for these animals are rivers and motorized pumps.

Table 4.3: Source of water in Mai-woini and Hagere-selam Tabias (Source: TAAA, 2009)

Tabia	**Hand pumped**	**Motor pumped**	**Rivers**
Mai-waini	4	1	2
Hagere-selam	6	1	-
Total	10	2	2

Generally, as the resettlement areas have water pumps, many of them had no water problem for their livestock. Moreover, though studies on irrigation activities have been carried out and found to be promising, currently irrigation activities are not as it is expected to be. The source of water for such irrigation activities is obtained from rivers, springs and harvested rain water.

Certainly, though the introduction of irrigation schemes in the area of resettlement will increase the rate of deforestation underway in the area, the program will increase the land cleared for cultivation and thereby increase the farm fields and grassland which could be employed for the cultivation of varied food and cash crops as well as for proper animal husbandry. This state of affairs will raise the spirit of the resettlers to make the place suitable for themselves and the following generations. The area is potentially suitable for irrigation. Since the commencement of the resettlement program 96 ha of land has been put under irrigation by using water of three rivers (Table 4.4).

Table 4.4: Source of Water for Irrigation and Area under irrigation in Mai-woini and

Tabias	River		Spring		**Total area irrigated**
	Number	Area under irrigation(Ha)	Number	Area under irrigation(Ha)	
Mai-woini	2	90.0	29	2.0	92.0
Hagere-selam	1	4.0	-	-	4.0
Total	**3**	**94**	**29**	**2**	**96**

*Hagere-selam Tabias **(Source: TAAA, 2009)***

Creating such opportunistic crop raising strategies (irrigation instead of only rain fall) is hoped to contribute a lot to the resettlement development option of the government in the sense that resettlers will get attracted to staying at their new place for ever and thereby develop the area to their fully fledged home Tabias.

4.1.2. Characterization of the socio-economic condition of resettlers

Under this heading a brief account has been made on the status of agricultural production, resettlers' origin and health problems and cares.

Agricultural production

As briefly mentioned in Chapter Three, the main economic activity of the study area is agriculture: crop cultivation and livestock herding. Livestock herding is practiced on traditional free grazing system. Both rain fed and irrigated crop cultivation are practiced in the area. Sorghum is the main crop cultivated in all Tabias and followed by sesame (Figure 4.2). The other crops grown in the wereda are cotton, teff, millet, maize, nihug, bean, peas, lentile, bultung, nut, adengur, and chick pea (Figure 4.2). Sorghum is cereal crop for domestic consumption, whilst sesame and cotton are for market as a source of cash for the household.

Average yield for Sorghum and Sesame of the resettlement area are, respectively, 18.35 quintal per hectare with CV of 23%, and 5.4 quintal per hectare with CV of 20% (Appendix 11). In 1997/98, 1999/00 and 2000/01 sorghum yields per ha were higher than the other years. This variation may be resulted from the variations in amount of rainfall and use of fertilizer among the basic reasons. These ups and downs have a direct impact on food availability and food security status of resettled households.

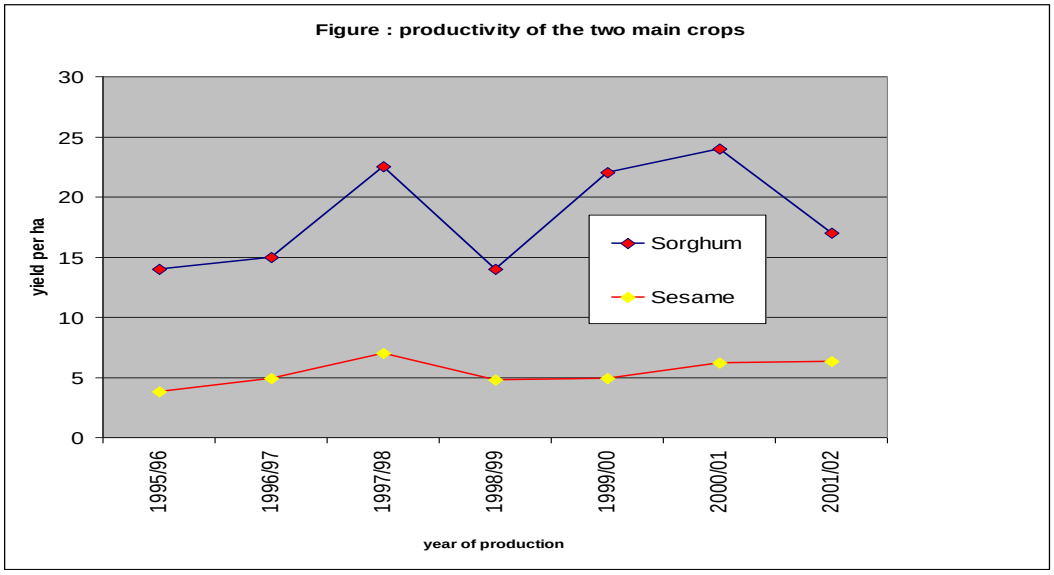


Figure 4.1: productivity of the two main crops

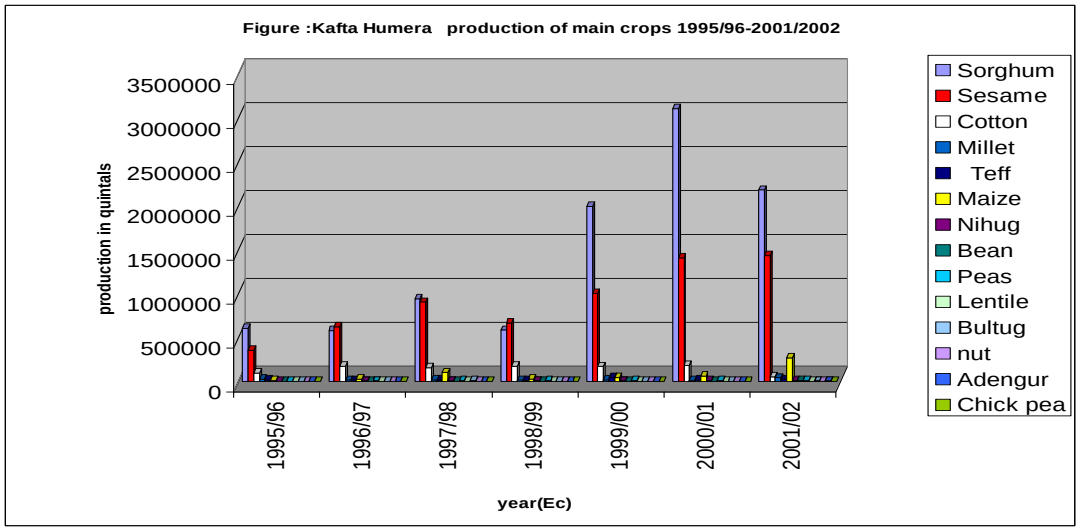


Figure 4.2: production of various crops.

There is relative high coefficient of variation in sorghum as compared to sesame. Between 75 and 80 % of household income of the population in the Woreda is from crop production, 20-25% from animal husbandry and/or 0-5 % from animal husbandry (Table 4.5).

Table: 4.5 Percentage Share of Annual Households Income by Source.

S.N	Sources of Income	Percentage Share
1	Crop cultivation	75-80
2	Livestock husbandry	20-25
3	Incense and gum collection and others	0-5
	Total	100

Source: BoFED, 2008

Economic activities are seasonal. For example, cropping is practiced from June to December. Incense and gum collection, fire wood collection and wood for construction, and traditional honey collection are practiced from January to May (Table 4.6).

Table 4.6: Seasonal Distributions of Economic Activities

S.N	Activities	January-May	June-December
1	Crop cultivation mainly sesame, cotton and sorghum		>>>>
2	Livestock husbandry	>>>>	>>>>
3	Incense and gum collection	>>>>	
4	Fire wood collection and wood for construction purposes	>>>>	
5	Traditional Honey collection	>>>>	

Source: BoFED, 2008

Departure and Destination of Resettler

Until Ethiopian calendar year 2001 (2008/2009); the Kafta Humera Woreda hosted about 17,000 resettled households that have arrived from the various woredas of the Regional National State of Tigray. These households have settled in 11 tabias out of the 20 tabias of the Woreda. (WARD, 2008).

Resettlers of Kafta Humera in general and the two already selected tabias in particular are composed of people who were displaced from their localities (due to war), people from densely populated areas of the Region, people living in most drought prone areas, and those who lived (and cultivated) in rugged mountainous areas, returnees from Eritrea and landless local youths (&adults). Appendix 1 shows the numbers of resettlers from different woreda of the region. Many of them were from both Central and N.Western zones of Tigray Region brought in the year of 2003 & 2004.In the third round (2005) of the resettlement program, more than half of the resettlers(9248) were from the Eastern part of the Region

Table 4.7: The Number of household heads who have brought 'Transfer Letter' **from their original area, and who returned to their original places, and those who were indecision in the years 2003-2008**

S.N	Woreda	Number of HH settlers	Settled households	Returned HHs	Total	HHs indecision
1	Kafta Humera	21,527	15,082	1,550	16,632	4,895
2	Tsegede	11,320	4,015	873	4,888	6,432
3	Sum total	32,847	19,097	2,423	21,520	11,327

Source: DPPC, 2008

More than 70% of the total resettlers (32,847) were made to resettle in Kafta Humera Woreda (Table 4.7). It was only 7% of the households who returned to their original area. About 34 % (11,327) of the total households were indecisive. About 60% (19,097) of the total households decided to settle in their respective resettlement sites.

As far as the two selected tibias (Maiwoini &Hagere Selam) is concerned , table 3.4 shows that more than 80% of the total resettlers have brought a 'Transfer Letter' to their respective resettlement administration within three consecutive years of resettlement. The other 3% of the total resettler returned to their original area. The remaining 1% of the total resettlers were indecisive whether to go their original home areas or the resettlement sites.

As also indicated in appendix 1 and table 4.4, the resettler of 2004 were from each zone of the Region. Some of them joined the original settlers. Tirkan, Aydola & Ruwassa were for instance resettlement sites that entertain additional settlers. Around 65% of the original settlers (2256) joined in Tirkan. With regard to the composition of sex, more than 90% of the total resettlers were male headed households. Only less than 10% of the total resettlers were female household heads.

Table 4.8: Second round resettlers from various zones of the Region -2004

s/n	Zone	No of HH head			HH size	Sum total	Remark
		M	F	Total			
1	Eastern	2180	224	2404	144	2,563	
2	Northern	624	63	687	32	719	
3	Central	5071	406	5477	183	5690	
4	N/western	3408	197	3605	55	3660	
5	Western	1282	144	1427	-	1427	
	Sum Total	**11,283**	**890**	**13,600**	**414**	**14068**	

Source: (DPPC, 2008)

Table 4.9: 2004-Rettlers in their destination by household head

2004						
s/n	**Woreda**	**HH head**			**HH size**	**Sum total**
		Male	Female	**Total**		
1	Kafta Humera	6464	550	8171	275	8446
2	Tsegede	4819	394	5483	139	5622
3	Total	11283	944	13654	414	14068

Source: (DPPC, 2008)

Table 4.10: Resettlers of 2005 by their original zone

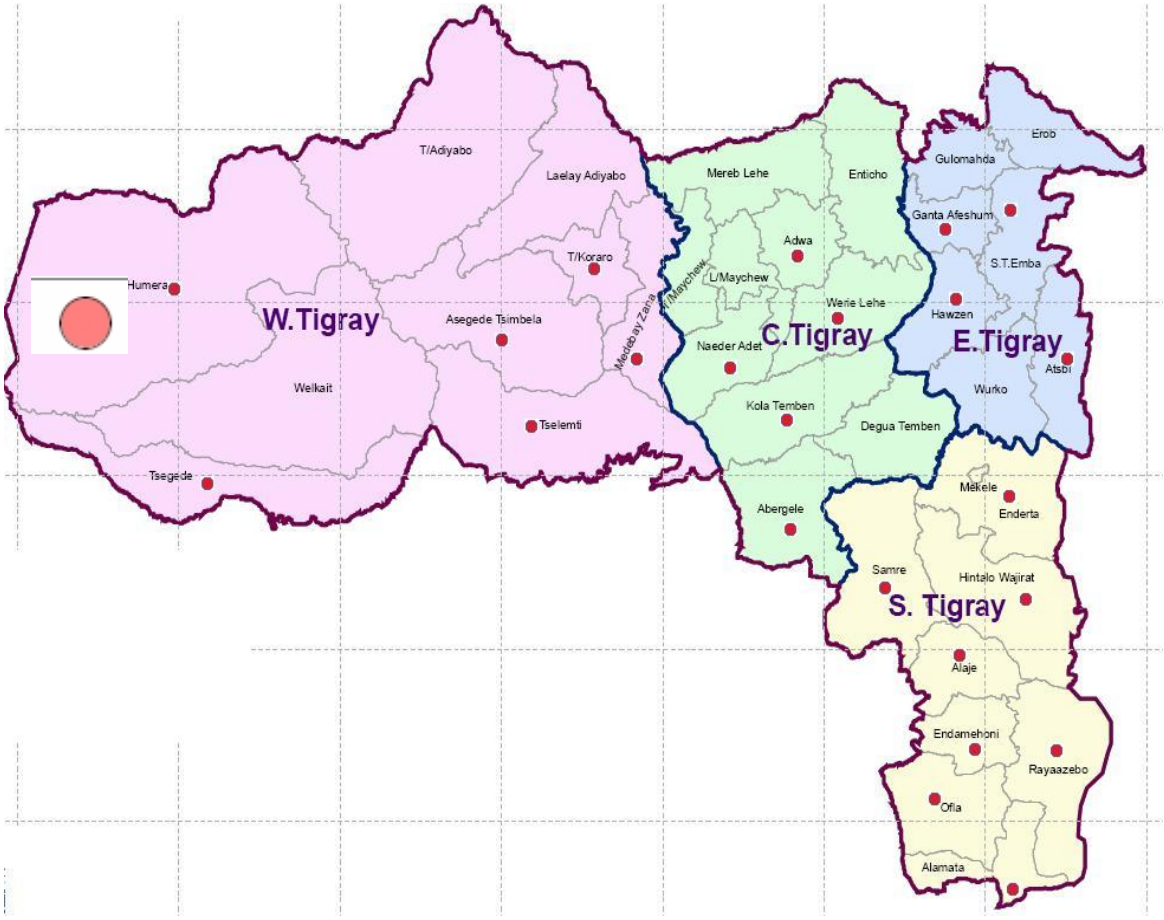
s/n	Original zone	HH head				Sum total	Remark
		M	F	Sum total			
1	Eastern	5791	943	6734	707	7441	
2	Southern	3141	342	3483	240	3723	
3	s/western	871	149	1020	83	1103	
4	Central	752	47	799	31	830	
5	Western	-	-	843	-	843	
Total		**10555**	**1481**	**12879**	**1061**	**13940**	

Source: (DPPC, 2008)

Table 4.11: Resettlers of 2005 by their destination area

2005						
s/n	Woreda	HH head			HH size	Sum total
		Male	Female	Total		
1	Kafta Humera	6,123	918	7,048	695	7,737
2	Tsegede	4,431	563	5,837	366	6,203
3	**Total**	**10,555**	**1,481**	**12,879**	**1,061**	**13,940**

Source: (DPPC, 2008)



Legend

woredas that participate in the resettlement program

Receiving Woreda for all resettlement program

Source: BoFED,GIS 2008 modified by the researcher

Figure 4.3: Map of participant woredas in the resettlement program.

Health Status of Kafta Humera Woreda Resettlers

Fifteen top diseases that were assumed to be common in the woreda have been identified from the outpatient and newly records of the health centers and clinics of the woreda for the years 1999 to 2001 E.C (Figure 4.4).

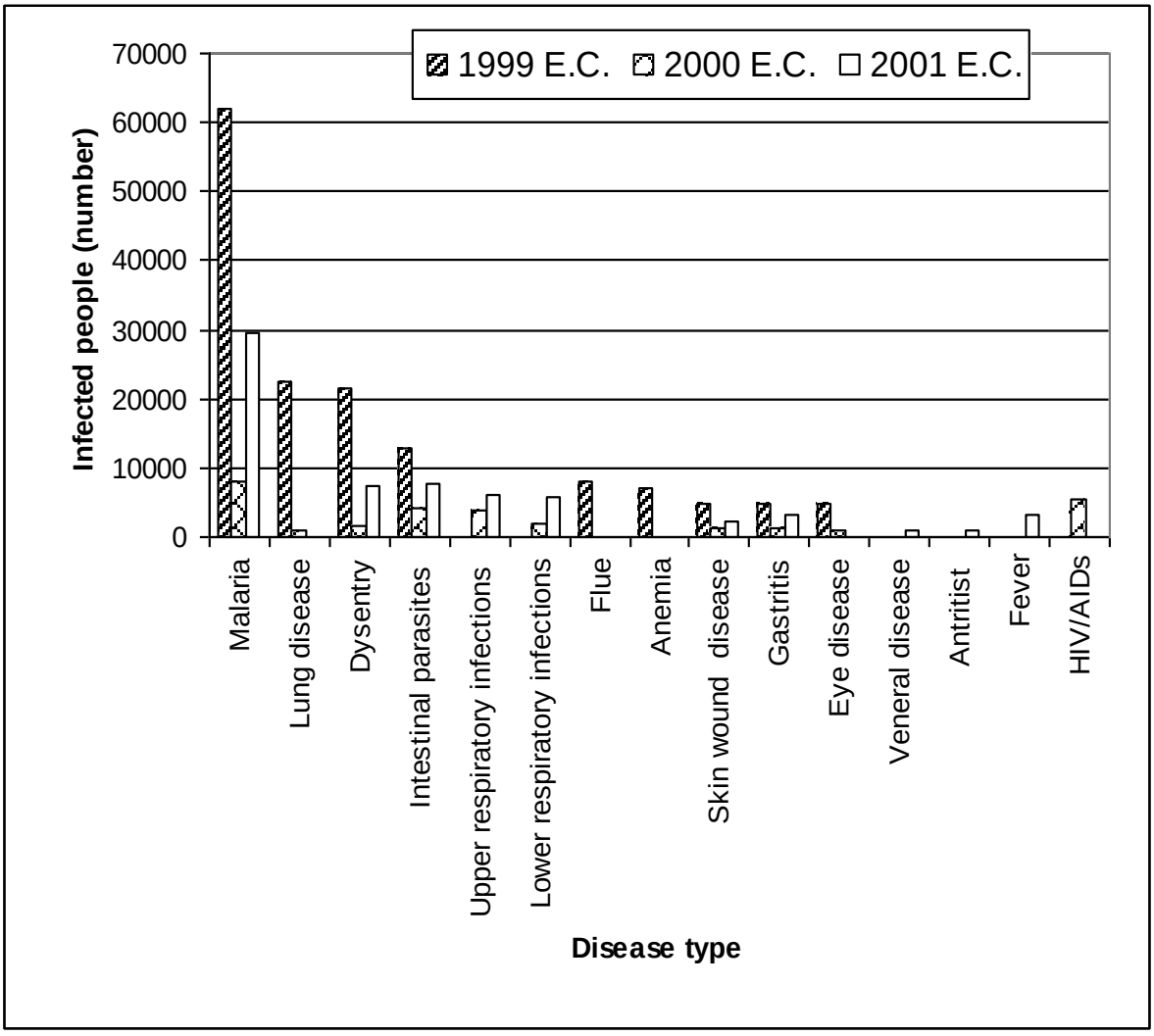


Figure 4.4 Top 15 disease prevalence in Kafta Humera Woreda (1999-2001 E.C)

Malaria was the predominant type of disease in the woreda in 1999 and 2001 E.C. There were 244,453 patients who reported to health centers and clinics of the woreda in three years (1999 – 2001 E.C.). Out of the reported cases in the three years, malaria accounted for 40.7 %, followed by dysentery (12.4%) and intestinal parasite (10.1%). On the other hand in 1999 there was no report case on respiratory infections and HIV/AIDs. Venerial disease was not reported in both 1999 and 2000. There were 5407 HIV/AIDS reported cases in 2000.

The prevalence of these diseases was not uniform spatially and temporarily. In many Tabias, though not at equal rate, a lower presence of all diseases have been seen in the years 2000 and 2001 as compared to the year of 1999. Spatially, there were relatively lower reports at Ruwasa, Rawyan, Miglab-Feres and higher rates at Miglab-Feres and Zerbabit (Appendix 9).

It has been described in chapter three that much of the area of Kafta-Humera wereda is characterized as kola. Such places are much known in hosting infectious diseases. Thus, health service provision is basic. However, from this study, it has been learned that in the Kafta-Humera Woreda there were 5 health centers and 14 health stations (Figure 4.4, Appendix 8). The problem here is not only the relatively few number of health centers and post but there is a very limited availability of the necessary drugs in each posts and centers. They are understaffed and with no adequate facilities (personal communication with post and center heads).

4.2 Food security indicators among resettlers

In take of 2200 kcal per day per person (AE) has been taken as a benchmark of minimum level of food security (FAO, 1998). The data of this study reveals that the minimum and maximum available kcal per day per person (AE) for a household member was respectively, 802 and 3349.

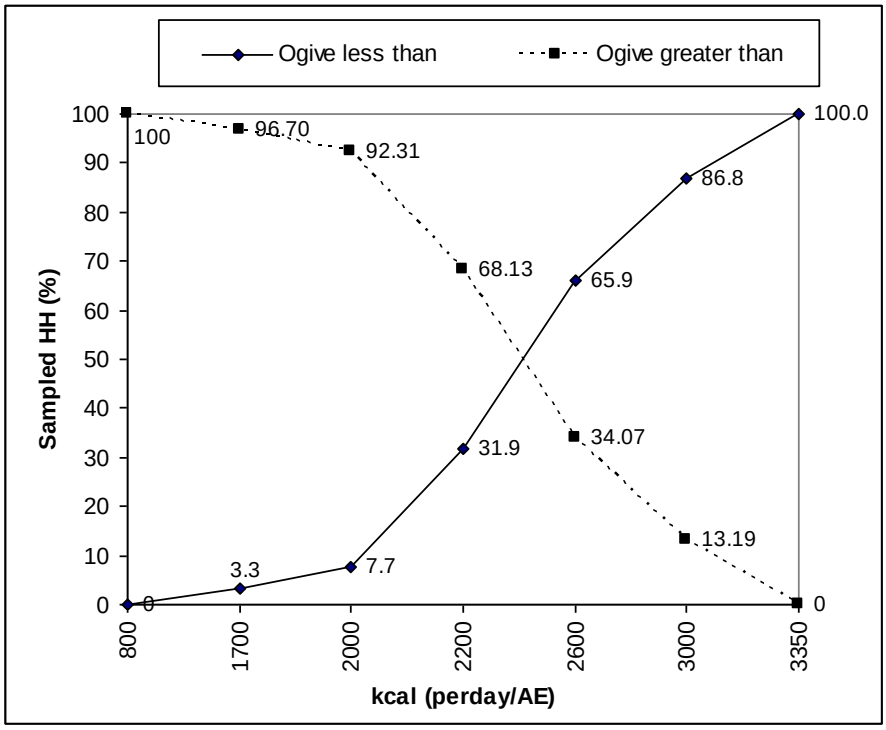


Figure 4.5. Relative cumulative percentage of sampled household heads: ''less than" the upper class boundary and ''greater than" the lower class boundary of available kcal (per AE/day).

Furthermore, the data of this study reveals that 68.1, 34.1 and 13.2% of the resettled households have respectively, greater than 2200, 2600 and 3000 kcal per AE/day. On the other hand, 3.3, 7.7 and 31.9% of the households have respectively, less than 1700, 2000 and 2200, kcal per AE/day (Figure 4. 5). Further investigation has been made to understand the predictor variables of food security. For this purpose, certain hypotheses have been drown in chapter one to look into the variables that have brought differences between food secure and insecure households of resettlers. To support or nullify those hypotheses, independent t-tests at the 0.05 level of significance have been applied. Summarized results of the statistical tests have been presented Table 4.12).

Table 4.12: Summary statistics of independent t-tests for selected predictor variables

I	Variables	Household Food Security Status						Test statistic (t)
		Food Secure (n_1 = 62)		Food Insecure (n_2 = 29)				
		Mean X1	Std. dev. Sd1	Mean X2	Std. dev. Sd2	Min	Max	
1	Age of household Head (years)	36.72222	8.038625	43.86486	12.79141	24	67	3.2714
2	Family size (AE)	3.340185	1.539417	2.765676	1.491834	.82	8.54	-1.7706*
3	Dependency ratio	.9166667	.8916277	.9567568	1.190131	0	4	0.1836
4	Tropical Livestock Unit (TLU)	6.682222	8.02133	1.191892	1.470521	0	27	-4.1095*
5	Farm land size (hectares)	4.509259	4.890779	1.797297	.6504214	1	23	-3.3469*
6	Annual Food Expd.(AE)	3998.765	1331.417	1850.272	456.4721	1125.815	18639.91	-9.4292*
7	Total income(annual) (Birr)	6364.263	2603.462	2895.512	1089.071	1125.815	18639.91	-7.6484*
8	Off farm income(annual)	4489.259	11128.02	493.2432	847.8864	0	50000	-2.1761*
9	Asset holding(birr)	18945	23143.35	5846.757	5623.114	800	80970	-3.3696*

10	Initial income	1799.204	1518.243	340.2703	803.3973	0	5000	-5.3483*
11	Total annual farm income(hh)	24903.52	23946.89	7968.378	5199.308	0	132000	-4.2270*
12	Per capita daily caloric Availability (kilo calorie)	3042.30	697.20	1936.02	245.75	800.20	3349	-2.3696*

* Independent Sample t- test, statistically significant at 0.05

The result of the test statistics (Table 4.12) reveals that the hypotheses that state there is no difference in livestock holding (TLU), farmland size, annual food expenditure, initial income, total annual farm income between food secure and insecure resettlers have been nullified at the 0.05 level of significance. On the other hand, the hypotheses that state there is no significance difference in age and dependency ratio of food secure and insecure resettled households has been supported. The test of each variable has been explained hereunder somehow in detail.

Age of household heads

The average age of both food secure and insecure household heads is 39 years with standard deviation of 11. The average age of household heads of food secure is 37 with standard deviation of 8, while the average age of household heads of food insecure is 44 with standard deviation of 13. The test statistics reveals that the mean difference (44-37 = 7) is not statistically significant. This conclusion differs from the theory mentioned in the literature review that "the older the household head, the more experience he/she has in farming and weather forecasting, and he/she is risk averter and therefore, tend to intensify and diversify his/her production activities and hence usually food secure". This deviation may happen due to the fact that all households with different age have equal exposure to the new resettlement site and hence equal adaptation and practices to the new site. Therefore, age cannot be predictor variable of food security. Though the mean difference is not statistically significant, the data reveals that the younger household head (average age 37 in this study) are food secure while older household head (average age 44 year in this study) are food insecure. This is in agreement with the conclusion made by Bekele E. (2000).

Family size

The mean family size of all sampled households in adult equivalent was 3.11 with standard deviation of 1.54. The average family size of food secure and insecure households is 3.34 and 2.76 respectively (Table 4.12). The mean difference is 0.57. The test statistics reveals that the mean difference is statistically significant at the 0.05 level of significance. And we conclude that a household heads with larger family size is food secure, while household heads with smaller family size are food insecure. This conclusion is different from the theory mentioned in the review of literature that "family size and food security status are negatively related for the very reason that the existence of large family could raise demand for food with limited food supply and resources". This deviation may happen due to two reasons: firstly, in the new resettlement site (study area) agricultural resources, for example land is not limiting, so that large family size can deploy large family labor and higher agricultural production and vice versa. Secondly, the mean dependency ratio for food secure households is lower than that of food insecure households. Thus, for household food security, what matters is not the family size but the dependency ratio.

Dependency Ratio

The mean dependency ratio for all sampled households was 0.9 with standard deviation of 1. The average dependency ratio for food secured households was 0.91 whereas for food insecure was 0.96. The mean difference is 0.04. The test statistics reveals that the mean difference is statistically significant ($P<0.05$). Thus, we conclude that the existence of large number of economically inactive family members could affect the food security status negatively. This is because working age population supports not only themselves, but also additional dependent members in the family. This finding complements the well established development and population theories, for example (Todaro, 1997).

Sex of household head

Out of 91 respondents 73 were male-headed and 18 were female-headed households. Among male-headed households 49 were food secure and 24 were food insecure. Likewise, within female-headed households 5 and 13 were food secure and food insecure respectively.

Table 4.13: X2 for test of relationship between sex of household head and food security status.

		Sex		
		Female	Male	Total
Insecure	Observed	13	24	37
	Expected	7.3	29.7	37
Secure	Observed	5	49	62
	Expected	10.7	43.3	54
Total	Observed	18	73	91
	Expected	18	73	91

To analyze whether food security/insecurity is related to sex of household head of the resettlers a X^2-test has been applied at the 0.05 level of significance. Tabulated chi-square (X^2) at the 1 degrees of freedom and at the 0.05 level = 3.84. Calculated chi-square is 9.3, which is much higher than the tabulated chi-square. Thus we reject the null hypothesis that states there is no relationship between sex of household head and food security status and conclude that there is a linkup between the variables. This finding supports the theory mentioned in the literature review that "male-headed households are more likely to be food secure than female-headed ones, because female-headed households have less working labor availability than male-headed. Consequently, it leads female-headed households to provide their lands for sharecropping and then leading them to food insecure".

Cultivated land size

Crop production principally requires the availability of suitable cultivable land. Cultivated land size of sampled households ranges from 1 to 23 ha (Figure 4.6). The average land holding size of all respondents was 3.40 with standard deviation of 4 ha very high CV (85.1%).

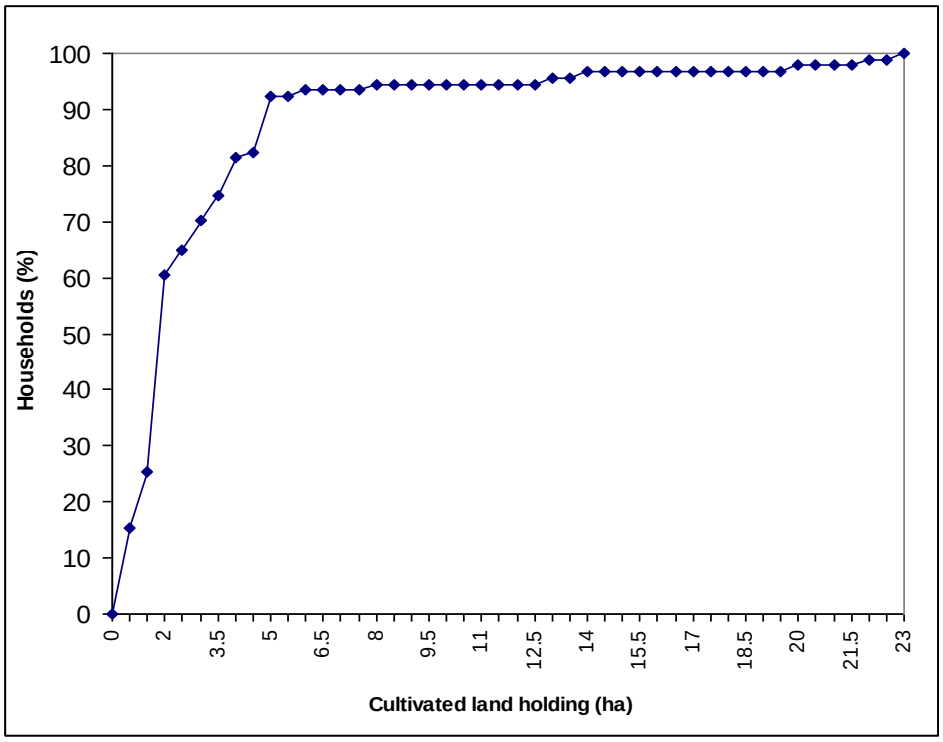


Figure 4.6 Relative cumulative percentage of sampled household heads ("less than" the upper class boundary).

About 60% of the households of resettlers have cultivated land of up to and less than 2 ha of lands per household, and about 92.3% the households of resettlers have cultivated land of up to and less than 5 ha of lands per household. About 5.5% of the households have cultivated land of between 5 and 20 ha per hh. Only 2.2% of the households have cultivated land of 20 and up to 23 ha per household (Figure 4.6).

This average cultivated land size of households of this study is much more than the national (1.53 ha/hh) and regional average (0.5 ha/hh). As mentioned above, viewing it region wise, the average size of land available to a four-person household is about 0.5 hectares which is too small to support the family on agricultural production alone. A one-sample t-test analysis has been applied to support or nullify the hypothesis that states "Ho: there is no significant difference between average farmland size of resettlers and national average (1.53 ha)".

The null hypothesis puts the average resettlers' farmland size equals to the estimated national

average (i.e. H_0= size of farmland of resettlers (3.4 ha) = national average (1.53 ha.)) The result of the test statistics is presented in Table 4.14.

Table 4.14. One-sample t test with μ = 1.53 ha/hh and $\bar{x}$ =3.4 ha/hh

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
Land size	91	3.406593	.4199622	4.006184	2.572265	4.240922

Calculated t = 4.4685 which is much higher than the tabulated t = 1.98 at the 0.05 level of significance and 90 degree of freedom. This result justifies the rejection of the null hypothesis. Thus we conclude that the mean land holding size of resettlers is statistically significant.

While the average cultivated land holding size of all sampled resettlers is 3.4 ha/hh, the average holding for food secure and insecure households is 4.5 and 1.79 respectively (Table 4.7). The mean difference was 2.71 ha. The mean comparison of the two groups in terms of mean cultivated land size reveals that the mean difference is statistically significant ($P<0.05$). Thus, we conclude that among the resettlers, farmers who have larger cultivated area are more likely to be food secure than those with smaller land area due to the fact that there is high possibility to produce more food.

Livestock holding

As mentioned in the literature part, livestock has an important implication on households' food security status. This is basically due to the fact that livestock are source of milk, meat, traction power, income and transport. They are also sold as one of coping mechanisms during food shortage. That is, a major asset that can easily be liquidated is more important in terms of implying better access to food. Livestock owned by the sample households include cattle, goat, sheep, donkey, camel and poultry. The total livestock population owned by the sample respondents was 404.94 TLU. The average livestock holding was 4.45 TLU per hh. About 35 % of the respondents were without livestock. The maximum number of livestock holding was 27 TLU per hh.

The average livestock holding of food insecure households was 1.19 TLU with standard deviation of 8, while the average holding for food secure households was 6.68 TLU with standard deviation of 1.47. The mean difference is 4.5 TLU/hh (Table 4.12). The test statistics reveals that the mean difference is statistically significant (P<0.05). And we conclude that a household heads with larger livestock size are food secure, while household heads with smaller or no livestock are food insecure. This result supports the theories reviewed in the review of related literature that states "a person who owns more TLU is more likely to be food secure than those who have less or have no".

Comparison was also made between before and after resettlement livestock holdings of resettlers. For this purpose, paired sample t-test has been applied to support or nullify the null hypothesis; "Ho: there is no significant difference between resettlers' livestock holdings before and after their resettlement".

The null hypothesis puts H_0 = average resettlers' livestock size before their resettlement (2.42 TLU) = average resettlers' livestock size after their resettlement (4.45 TLU)). The mean difference is -2.03 TLU. The result of the test statistics is presented in Table 4.15.

Table 4.15: Paired t-test for livestock ownership before and after resettlement ($\overline{X_1}(2.42) = \overline{X_2}(4.45)$ ***or*** $\overline{X_1} - \overline{X_2} = 0$***)***

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
BTLU	91	2.418132	.3303987	3.151803	1.761737	3.074527
ATLU	91	4.44989	.711822	6.790349	3.035731	5.864049
Combined	182	3.434011	.3985155	5.376267	2.647677	4.220345
diff		-2.031758	.7847636		-3.580278	-.4832385

Note: BTLU is TLU holding before resettlement, ATLU is TLU after resettlement

Calculated t = -2.589 which is much lower than the tabulated-t, i.e., lower critical limit (-1.986) at the 0.05 level of significance and 180 degree of freedom. This result justifies the rejection of the null hypothesis. And we conclude that size of livestock (TLU) of resettlers after the resettlement program was higher than the livestock size they had before the resettlement program at their original places.

Food expenditure and Total expenditure

To examine the position of resettlers with respect to access to food, paired t -test analysis has been used to accept or reject the null hypothesis "H_0- there is no significant difference between food expenditure and total expenditure (AE)".

Table 4.16: Paired t-test for food and total expenditure

```
------------------------------------------------------------------------------
Variable |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
Food expn.      91    3125.201    157.3601    1501.119    2812.578    3437.825
Total ex |      91    4953.892    285.1886    2720.526    4387.315    5520.469
---------+--------------------------------------------------------------------
combined |     182    4039.547     176.057    2375.139    3692.158    4386.935
---------+--------------------------------------------------------------------
    diff |            -1828.69    325.7219               -2471.415   -1185.966
------------------------------------------------------------------------------
                                                              t = -5.6143
Ho: diff = 0                                     degrees of freedom = 180

    Ha: diff < 0                 Ha: diff! = 0                 Ha: diff > 0
 Pr (T < t) = 0.0000         Pr (|T| > |t|) = 0.0000          Pr (T > t) = 1.0000
```

As indicated in the table above, on average, resettlers' food and total expenditure is 3125 & 4953 birr respectively.

The test has pr (T<t) value of 0.0000 indicating the difference between food expenditure and total expenditure is significantly greater than zero. This is, thus, an evidence for the fact that there is significant difference between food expenditure and total expenditure (AE). That is, H_0 can safely be rejected. The implication here is that the difference (1828.69 birr) can be either saved or used for other purposes by the individual.

The 95 percent confidence interval for the mean difference indicates that one can save or use of birr 1185.966 to the minimum and birr 3692.158to maximum. The chance that the difference will be out of the given interval is only five in hundred.

4.3. Food Balance Sheet for Kafta Humera as a measure of food security

Food Balance Sheet has been computed for the period 1995/96-2001/02 EC using 2200 Kilo Calories of food per day per person as the minimum nutritional requirement. This is equivalent to 228 kilogram of cereals (Sorghum equivalent) per person per annum. Here; the rough estimation has been made by taking commonly cultivated main crops of both resettlers and host communities in the study area. Such of reference cereal crops in the study area includes sorghum, millet, teff and maize with 1, 0.94, 0.98 and 1.04 multipliers for sorghum equivalent respectively. These multipliers have been computed by the researcher using sorghum equivalent cereals. That is, 100 gram of sorghum, millet, teff, and maize contains 347,327,341,362 Kilo calories respectively (Feredu Nega, 2008). While calculating the balance sheet, the researcher has taken only dominant cereal crops though crops like sesame are dominant source of income in each of resettlement sites. It is also with the belief that as major portion of farmlands occupied by few investors are cultivated for sesame, concentrating on few of cereal crops produced by the resettlers will minimize overestimations of productions in the study area.

Table 4.17: Food balance sheet that indicate food status of kafta Humera Woreda taking 1995/96 – 2001/02 crop year estimated average cereal production as basic data at different scenario.

S.n	Variables	1995/96	1996/97	1997/98	1998/99	1999/00	2000/01	2001/02	Growth rate
1	Production of cereals in Sorghum equivalence (in Qnt)	648,205	620,525	1,074809	619,819	2,082440	3,185060	2,512232	49%
2	Less 15% post harvest Loss	97230.7	93,078.75	161,221.35	92,972.8	312,366	477,759	376,835	-
3	Less 6% seed	38,892.3	37,231.5	64,488.54	37,189.14	124,946	191,103.6	150,734	-
4	Net production (1)_(2)_(3) (Qnt)	512,082	490,214.75	913,587.65	489,657.06	1,645128	2,516197.4	1,984,663	49%
5	Food aid	0	0	0	0	0	0	0	-
6	Total grain available (4+5) (Qnt)	512,082	490,214.75	913,587.65	489,657.06	1,645128	2,516197.4	1,984663	49%
7	*Population	83,343	85,454	87,619	89,838	92,114	94,448	96,840	2.5%
8	Food grain requirement (2.28 Qt/year)	190,022	194,835	199,771	204,831	210,019	215,341	220,795	2.53%
9	Food balance (6)-(8)	322,060(**2040 kc***)	295,379(1871 kc)	713,816(4520.8 kc)	284,826(1804 kc)	1,435109 (9089kc)	2,300856(14572kc)	1,763868(11171kca)	62.3%
10	Food self sufficiency ratio (4)/(8)	2.69(**1.69)	2.51(**1.51**)	4.57(**3.57**)	2.39(**1.39**)	7.80(**6.80**)	11.68(**10.68**)	8.98(**7.98**)	44.8%
11	Ratio of surplus to total grain (9)/ (6)	0.62	0.60	0.78	0.58	0.87	0.91	0.89	

Sources: Computed by the researcher using data from Kafta Humera bureau of agriculture and rural development, CSA, and FAO.

Note:

* Projection was made based on Woreda's growth rate of population (2.5%) using formula $\mathbf{P_A=P_o*e^{rt}}$

** Numbers under bracket indicate average food gap. It is 4.8 which signifies surplus.

*** Daily calorie (per capita).

Accordingly, While the overall average production of cereals and food surplus (excess) grew at an average of 0.49 (49%) and 0.62 (62%) respectively, food requirement of the Woreda increased only by 2.53%. The self sufficiency (availability) ratio, which is measured as the ratio of the sum of net production of cereals to the requirement of food, has also increased by 0.448 (45%).This all state of affaire implies that there is sufficient amount of food produced in the study area with positive tendency though this positive trend of production could result from rapid deforestation in the area of concern which would be discussed in the next section of this research work.

4.4. Aggregated Household Food Security Index (AHFSI)

As mentioned in the material and method part G, H, Ip & Ω are relevant variables to compute AHFSI. This index is employed basically to assess whether the resettlers are food secure or insecure at a household level based on the three elements of the FAO'S concept of food security: availability, stability of food supplies and access to food.

4.4.1. Food gap of the average undernourished (G):

Aggregated household food security index has been computed based on data collected from households and other secondary data. Average food gap of population has been computed using average food self-sufficiency (Availability) ratio of the Woreda's food balance sheet for the years 1995/96-2001/2002 EC. However, the food gap result of the Woreda may only be rough estimation of the whole population. Thus, average calorie intake of the sampled resettlers (through consumption survey of 91 respondents), who are under predetermined calorie requirement (2200 kcal), has been estimated. It was 1936 kcal. Thus, the difference between average food availability (1936 kcal) for undernourished and requirement (2200 kcal) was 264 kcal/day/adult equivalents. That is, 12% gap from the predetermined 2200 kcal. Considering average requirement as 1, the food gap was 0.12.

4.4.2. Head-count of the sample population undernourished (H)

The researcher has computed BMI of those undernourished individuals though available data of proportion of population who are undernourished has been assessed by a general survey conducted by the Health Bureau of the Woreda.

Based on equation 3, 23% of total population was undernourished.

4.4.3. Inequality in the distribution of individual food gaps of undernourished (Ip)

Lorenz curve has been drawn using food calorie intake of undernourished resettled households to determine coefficient of equality/inequality, and it was found to be 0.023 which actually shows the existence of low inequality in terms of daily calorie intake of resettlers below the predetermined kcal (2200 kcal).

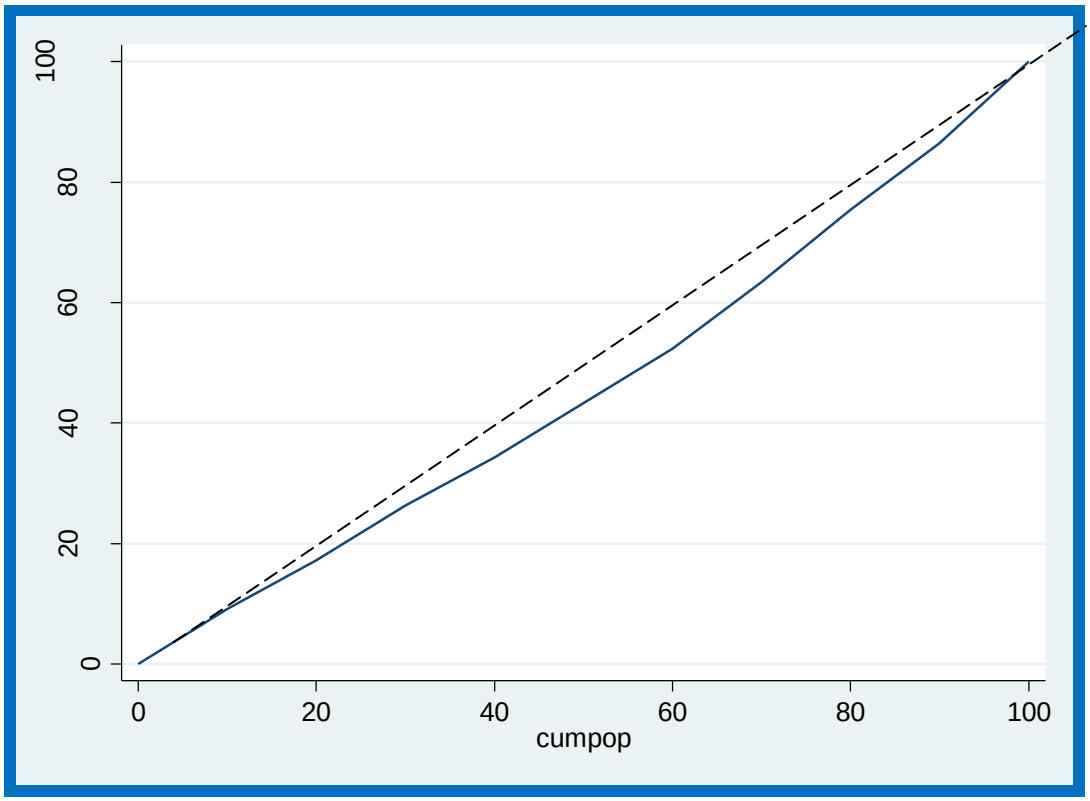


Figure 4.7: Lorenz curve based on cumulative percentages.

A coefficient that shows inequality between and among resettled households has also been computed using food expenditure (incomes) of those under food poverty line (2200 Kilo calories per person per adult equivalent). The Gini coefficient for the area was 0.24[2] which is approximately equals to the national one (0.28).

[2] Detailed calculation and procedures are presented in Appendix 2.

The result reveals relatively less inequality among resettled households that might be resulted from provision of equal size of farmland (2 hectare) for major portion of the resettlers.

4.4.4 Coefficient of variation in dietary energy supply (Ω).

Ω - is the coefficient of variation in dietary energy supplier, which gives the probability of facing temporary food shortage

$$\mathbf{CV} = \frac{SD}{\bar{X}} \quad \mathbf{x\ 100}$$

Coefficient of variation (CV) = $\frac{245.75}{2997}$ x100 = 8.2%

Finally, aggregated household food security index (AHFSI) has been computed as:

Finally, aggregated household food security index (AHFSI) has been computed as:

$$\text{AHFSI} = \mathbf{100-[\{G+ (1-G)\ Ip\} +0.5\ \Omega\ \{1-H\ [G-(1-G)I^p]\}100}$$

= 100-[0.23{0.12+ (1-0.12)0.07} +0.5(8.2) {1-0.23[0.12-[0.12-(1-0.12)0.07]}] 100

=100-[0.23{0.12+ (0.88)0.07+0.5(8.2) {1-0.23[0.12-[0.12-(0.88)0.07]}] 100

=100-[0.23{0.12+0.0616} +4.1{0.77[0.12-0.0616]}] 100

=100-[0.23{0.1816} +4.1{0.77[0.0584]}] 100

=100-[0.041768+0.1843688]100

=100-[0.2261368]100

=100-22.6 = 77.4

According to the range value set by FAO this computed result showed that there is medium level of food security in the study areas. After ensuring this state of affaire, determinants of food security differential of resettled households was treated using logit model.

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4.5. ***Application of logit model*** *to identify factors that determine food security of resettled households.*

As mentioned in the material and methods of this paper, hypothesized variables which were thought to determine food security status of resettled households were tested using a logit model. Here; independent variables were entered into the model. The dependent variable is the level of food security of a household which is expressed as a dummy variable where zero represents households that fail to meet minimum food calorie requirement (2200 kcal) and one otherwise. Some variables were dropped merely to avoid multi collinarity among independent variables.

Table 18: Logistic regression for food security causations using different variables.

```
Logistic regression                               Number of obs   =         91
                                                  LR chi2 (14)    =      82.83
                                                  Prob > chi2     =     0.0000
Log likelihood = -20.064292                       Pseudo R2       =     0.6736
------------------------------------------------------------------------------
    fodsecst |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       sexhh |   .7963516   1.365832     0.58   0.560    -1.880631    3.473334
       agehh |  -.1193906   .0542651    -2.20   0.028*   -.2257483   -.0130329
     landsiz |   2.391102   1.098658     2.18   0.030*    .2377721    4.544432
     offfinc |   .0011295   .0007544     1.50   0.134     -.000349    .0026081
    iniincom |   .0010681   .0006155     1.74   0.083**   -.0001382   .0022744
       hhase |   .0000266   .0001205     0.22   0.825     -.0002097    .0002628
   fertiluse |   .3162083   1.220457     0.26   0.796    -2.075844     2.70826
avetravelf~q |   .6228073   .8261992     0.75   0.451    -.9965133    2.242128
```

credser	1.2889	2.10763	0.61	0.541	-2.84198	5.419779
atlu	.0332778	.2592683	0.13	0.898	-.4748787	.5414343
irriguse	3.108826	1.550193	2.01	0.045*	.0705031	6.147148
tabia	-1.519823	1.130332	-1.34	0.179	-3.735233	.6955865
soity	.2165854	.8605818	0.25	0.801	-1.470124	1.903295
edulev	.3921984	.6273817	0.63	0.532	-.8374471	1.621844
_cons	-3.849265	3.480598	-1.11	0.269	-10.67111	2.972582

* 5% level of significance

**10% level of significance

As expected, land size is negatively associated with food insecurity. That is, the larger the size of the land significantly reduces the probability of becoming food insecure. As can be seen from the model it has positive coefficient with strong statistical ground to support the premise that resettled households have high probability of becoming food secure while their cultivable farmland size increase in addition to what they have been endowed with as initial farmland (2 ha per HH).Put it differently, those resettled households with larger farmland size have high probability of becoming food secure as compared to resettlers with smaller portion of farmlands. However, even though the coefficients for household asset, fertilizer use, and educational level, soil type, TLU, off farm income, average travel frequency and credit services are positive, there is no statistical justification to support that households having the mentioned variables are better off in terms food security. In addition, though the coefficient for dependency ratio is negatively associated with food security, there is no strong statistical ground to elucidate variation in the level of food security among the resettled households.

On the other hand, age of households head increases the probability of falling into food insecurity. The result implies that the probability of falling in food insecurity is high for household headed by seniors (old age) than those headed by youngster .This seems in contradiction with conventional theory for the reason that both age groups (old and youngsters) resettle in the same environment implying that the two groups develop similar experience for same area for this short period of time. The experience the old headed household had in their former area would contribute little to the new area as compared to their former (original) area. This state of affairs is rather explicable in terms of the fact that a younger person can work

more by moving here and there compared with an elderly counterpart in any seasons. This is related to the fact that young household heads could resist the raising temperature in time of preparations for agriculture. This might not, however, be true while the resettler stay in the area for a longer period of time.

Even though the coefficient for initial income is very small, it is significant at 10 % level. While the resettlers arrived in the woreda they were equipped with various resources other than government's financial support. Oxen owned and financial asset, perhaps from different sources, were among the most important means of income generation which enabled the resettled households to harvest adequate crops by expanding the size of farmlands by means of either land renting or sharecropping. The result, thus, seems in accord with what has been reported in the general survey carried out in the area mentioned in the literature part.

Irrigation use was also found to be significant at 5% level - There is, thus, a strong ground to support the hypothesis that irrigation usage increases the probability of food security. This all may result from possibility of irrigation use in raising varied types of food and cash crops as well as the proper handling of animal husbandry. Irrigation use, thus, increases the possibility of income diversification which all enables resettlers to have access and there by fulfilling their basic necessities. The result of the model, therefore, reinforces the conventional theory.

Though coefficient for sex of household head (i.e. being female-headed or male-headed household) and the level of education of the head were also positive; it was found statistically insignificant to explain variation in the level of food security. Descriptive analysis made at the beginning of the discussion showed significant difference before and after resettlement in terms of size of livestock ownership. The result of the model, however, indicates that having large size of livestock has small effect on the probability of being food secure .But; the coefficient is very small and also statically insignificant.

4.6. Environment (Deforestation)

So far, the researcher has tried to examine the status of resettled households' vis-à-vis its determinants on attainment of food security. This section of the paper also descriptively analyses the resettlement program with respect to environment in the study area.

4.6.1. Level and trends of deforestation

According to the Tabia administration office, the most important factors responsible for the enormous destruction of vegetation in the study area are those associated with bringing forestland in to arable (farm) land, followed by human consumption for housing, fuel, farming implements and furniture. Even though, it was a bit better during the period of the survey for this research, initially settlers cut the best trees present in the area and cleared woody areas indiscriminately for the above cited purposes.

This improvement in the management of natural resources has come, though much remains, with improvement in the coordination of the program such as the current serious enforcement of certain rules such as strictly forbidding the cutting of multipurpose tree species and due to proper training given to resettlers.

The fact that resettlers could be blamed for the enormous destruction of vegetation in the study areas is affirmed by the settlers themselves. In connection with this state of affairs, all the respondents (100%) said that the area was indeed covered with relatively more dense vegetation than it is currently. Most of the woodland has been converted to farmland.

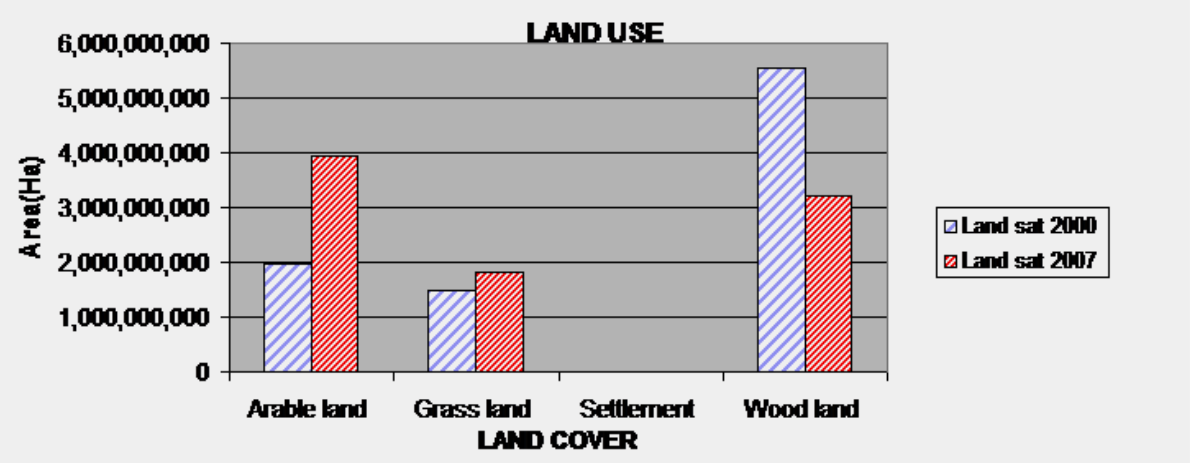
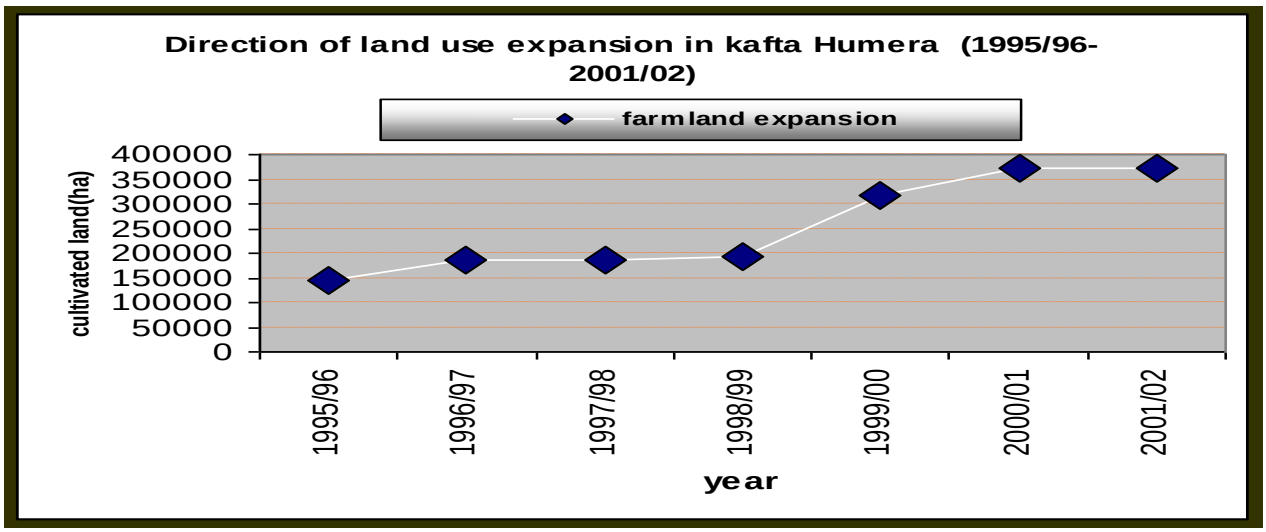


Figure 4.8: Changes Land use between 2000 and 2007

As shown in Figure 4.8 (appendix 12), there have been marked decreases in wood land (41.9%) and increases in arable land (100.1%) in the Kafta- Humera Woreda in general. This state of affairs is, certainly to have a spill over on the 2 tabias this research work is concerned.

Discussion with key informants revealed that resettlement has brought about destruction of forest resources because of human intervention. In general, all stakeholders in the situation at issue (host community elders and resettled farmers, tabia leaders and woreda administrators) agree that although such intervention dated back to the pre- resettlement period, the negative impacts were negligible given the low population density in the past. The cited informants contended that the destruction of floras and faunas in the area is beyond tolerable limit after resettlement though there has been some improvement in recent years as a result of education and bridging the gap between implementation of the program and follow up of the program. This situation, to some extent, has increased the awareness of the settlers on natural resource management and conservation. The enforcement of some directives such as forbidding cutting multipurpose tree species and compelling farmer to leave a given number of exceptionally important tree species in each hectare of land, also, has some effect on farmers to heed to some proper land management. This all situations are also reinforced by the yearly report of the woreda and the region which are to be used as source of the discussion. Figure 4.9 shows the direction of deforestation as a result of farmland expansion. The farmland expansion has shown 18.89 % average annual growth within consecutive seven years since the time of resettlement in the study area. This rate of growth would reinforce the mentioned land satellite information that the increase in food production is basically positively correlated to farmland expansion (Deforestation).

Figure 4.9: Size of farmlands (ha) used for cultivation of different crops between 1995/96-2001/02 EC. (Data: WARD, 2008).



4.6.2. Forest resource use and replenishment

As stated elsewhere above, there is enormous destruction of vegetation in the study area. The major causes for the disappearance of trees in the areas are bringing forestland into agriculture, human consumption for construction and fuel as well as for furniture and agricultural implements.

When asked as to the source of their firewood, 75% of my respondents contend that they get them from the forest, while only 25 % said that they obtain such items from their own farmland. Asked how much firewood they consume every month, 75 % said 3-6 donkey loads while the balance 25 % replied that they consume between 0.5 and 2 donkey loads. Given the fact that all the farmers' interview use firewood for their household consumption, the rate of depletion is high by any standard. It is, however, a relief amidst the large scale depletion to learn that some farmers are planting trees such as 'Nim', ,'Awhi' and 'Kinchib' and thereby augmenting the biodiversity of the area.

While the land allotted to resettlers was initially covered with 60% agriculture, 28% both forest and agriculture, and the balance 12% forest, the status of the current resettlers, farmland is as follows.

Table 4.19: Level of Resettlers/farmers forestation

Number of trees per hectare	Number of farmers with this amount	Percent of farmers with this amount
1-10	**46**	**50**
11-20	**28**	**30**
21-30	**11**	**11**
31-40	**6**	**6**
>40	**3**	**3**

Table 4.19 reveals that most farmers /settlers (more than 90% of them) gave no heed to the government's advice that farmers have to leave 40 exceptionally important tree species in each hectare of land given for cultivation.

Asked whether they have selected and grown trees of interest out of the naturally or wildly grown plants in their farmlands, about 70% of respondents gave positive answers. Table 4.20 indicates this state of affairs.

Table 4.20: Farmers that have nurtured and grown wild plant

Number of plants trees	Number of farmers with this amount	Percent of farmers with this amount
0	**25**	**36**
1-5	**22**	**32**
6-10	**8**	**12**
11-15	**8**	**12**
16-20	**6**	**8**

Out of the total respondents, 69% have nurtured and grown seedling that grow into trees. This situation shows that farmers can bring about natural regeneration of trees and increase the forest coverage of an area.

4.6.3. Training and education given to resettlers on environment protection

Some training and education concerning on the on going of high rate of deforestation and on its concomitant results are given to resettlers. This, amongst other things, includes avoidance of the depletion of trees in plots of farm lands as well as protection of wild life in the areas of resettlement. In fact, there are certain woody cutting species (about 30 of them during the survey period) that are not subject to cut or are strictly forbidden to cut. It is also expected that every farmer to leave some exceptionally important tree species in each hectare of land given for cultivation. Moreover, the training is supposed to include tree species that help to protect bush fire, tilling the land intensively and exercising crop rotation as well as the use of fallowing to maintain soil fertility.

When asked whether or not such training is given, 70 % of the 91 respondents conceded that training was given. Regarding the frequency of such training while, 40 % of the respondent said that it is given when meetings are undergoing, 40 % of the respondents replied that it is given only once a year, while the 20 % respondents claimed that it is given weekly.

This state of affairs indicates that, the training given to raise the awareness of the settlers on natural resource management and conservation seem to be insufficient and it is done on a haphazard manner.

4.6.4. Alternative solutions to mitigate deforestation in the area

Tabia administration leaders are taking certain steps to mitigate the degradation of forest resources brought about by resettlement and the concomitant human intervention. As a result, they have forwarded the following suggestions.

- Educating resettlers on the value and importance of forest and wild animals.
- Resettlers should use forest resources under the authorization of Tabia administrators or other concerned authorities.
- Establishment of forest conservation and bush fire committees as well as election of forest guards to enforce the directives seriously.
- Establishment of exclusive parks for wildlife/wild animals and brining people who break the law of conservation under persecution (i.e. sue and punish illegal farmers caught cutting trees and killing wild animals).
- Controlling illegal trafficking of forest products (fresh cut poles and for fuel, for example).

Among the responding farmers some said they abide by these rules and that training is also given to them so as to do away with their activities of disturbing the natural vegetation.

4.6.5. Resettlement area as a permanent residence area

It is the intention of the government that settlers should take the resettlement areas as their permanent residential places. The keyword of **"do not offend the setters",** which is the slogan of many Tabia administrators is a testimony to the government's desire that new comers should see their resettlement areas as their own permanent homes (Kelemework, 2008).

In connection with this state of affairs, Tabia administrators' responded to a questionnaire regarding resettlers' old and new homes were as follows. About 85% resettles in Tabia Hagere- selam, around 70 % settlers in Tabia Maiwaini have the intention of staying/ residing in their respective resettlement areas though there were resettlers who got returned to their original area abandoning their resettlement areas.

From observations in the various tabias, it was evident that resettlers, who want to stay in their areas permanently, were engaged in natural resource development and protection of wood vegetation and wildlife, while resettlers that, were not willing to stay permanently in their resettlement areas, were more often involved in opportunistic income earning activities such as cutting trees for furniture, firewood and charcoal and thereby causing massive destruction on forest resource. In fact, they were environment unfriendly group. Reasons forwarded for not having the intention of staying in their resettlement areas permanently were reduction in the productivity of the land in settlement areas, too much or unnecessary rain that depress good harvests and the like.

4.6.6. Major environmental problems and solutions from the point of view of resettlers

a) Major environmental problems

The following major problems were stated by some settlers in the studies in two tabias of resettlement, and by respondent farmers who were approached with respect to the concerned issue.

- The massive presence of the degradation of forest resources as a result of bringing the forest land under cultivation and livestock grazing as well as settlements.
- Presence of opportunistic income earners and returnees which cause difficulties in training and checking their activities of environmental depletion.
- Problems of reduction in land productivity, lack of crop rotation in farming, problems of weeds and pesticides, lack of roads that connect them to main highway and the farmlands.
- Lack of training and education from the side of resettlers regarding the importance of vegetation with respect to soil protection from erosion by wind and water and providing organic material to maintain levels of nutrients essential for healthy plant growth.
- Lack of fixed boundaries of tabias which brings about administration, security and protection problems.

- The presence of gaps in the law enforcement bodies, i.e. those who violated the law are set free under the pretext of lack of witness for activities undertaken clandestinely. So what remains to those who enforce the law is enmity.
- Temperature rise in the area of concern.
- Problem of safe drinking water in Tabia Maiwoini.

b) Suggested solutions from the point of view of resettlers

After a thorough discussion on the various problems concerning the effect of resettlement on forest resources and thereby on the total environment of the resettlement areas the following recommendations were put forward by resettlers as possible solutions to the problems at issue.

- Provision of continuous training to resettlers on the use of natural resources, laying out methods and steps on conservation of forest resources, selecting naturally grown seedling and nurturing them to fully grown trees, and handling resettlement areas in each tabia to the respective resettlers as sole care takers of forest areas.
- Establishment of effective controlling mechanism for the conservation and nurturing of forest resources.
- Avoiding opportunistic income earners ('Wofri Zemet'), i.e. spontaneous settlers who come to the settlement areas on their own free will and then leave the place after cutting a lot of wood and destroying the vegetation indiscriminately for the preparation and sale of furniture, firewood, and charcoal. In short, differentiation should be made between permanent resettlers and opportunistic resettlers and treated accordingly. It has to, thus, get adequate considerations.
- Carrying out research and development on suitable crop rotation systems, introduction of state of the art technology, and support through technical people of high caliber.
- Establishing and operating soil and water conservation activities.
- Demarcating the areas and boundaries of the specific Tabias.
- Demarcating of Livestock grazing lands.
- Introduction of alternative means on meeting one's construction, fuel, furniture and agricultural tools.
- Enabling residential / resettlement Tabias to have representatives in the woreda assembly.

Chapter Five

5. Summary and Conclusion

5.1. Summary

Food Security in Ethiopia has remained an unfulfilled dream for a substantial number of people for a long and continuous period of time. Fully aware of this state of affairs, the current government has designed and is implementing several development programs. One of these development alternatives is a resettlement program that helps people so as to do away with the resultant problems from densely populated and drought prone areas as well as displaced citizens and the unemployed youth find work and live in fertile areas of the country.

This being so, this research work is undertaken to critically appreciate the program by examining the food security status of resettlers in the study area ; assessing the determinants of household food security differentials ; assessing the impact of the program on the environment ; and forwarding certain suggestions for ways of improving the program should the need arise.

The choice of study area was dictated by conventional reasons in the sense that the Kafta-Humera Woreda has a large number of people who resettled from many other woredas of the Tigray Regional National State, and from the fact that the Woreda has both institutional and physical infrastructure .This circumstance has made it possible for the researcher to have access and deep insight into exploring the effect of resettlement program in the livelihoods of the various communities in the region. Likewise, tabias with settlers for a relatively longer period of time and with relatively larger forest and wild life were selected in order to respectively reflect the degree of food security or otherwise in households and the consequences of resettlement on environment.

Concerning the methodology used in the study, both primary and secondary data were employed in getting the necessary information for the analysis of the study. Sampling in each tabia was based on the proportion of the population in the respective tabias after determining sample units applying the above

mentioned formula. Moreover, the aggregated household food security index (AHFSI) and food balance sheet has been used to examine food security status of resettlers at household levels. In addition to this, the use of the Gini-Coefficient in measuring undernourishment was employed in evaluating level of inequality among food insecure households. Furthermore, the logit model was applied to find out the factors that bring about food security (i.e., to determine food security causation) among the resettled households by employing food security status among households as the dichotomous dependent variable. The methodology has sufficiently addressed the objectives of the study.

As a result, taking food poverty line (2200 kcal) as a benchmark, it was found that around 68 % (i.e., 2/3) of households in the study area are food secure while the remaining of balance 32 % (i.e.,1/3) of the households are insecure.

Moreover, this situation was also reinforced by fact that the resettlers are food secure (at sufficient level) at household level witnessed by both AHFSI and food balance sheet of the selected tabias and woreda respectively. All in all this state of affair indicates that resettled households are food secure and self-sufficient in food in the areas visited for the study.

Descriptive statistical analysis has been made based on the potential explanatory variables of interest discussed in the study. Accordingly, more than ten of the variables were found to show significant difference between secure and insecure resettled households at 0.05 level of significance.

An assessment of the basic determinants of household food security differentials (using logit) showed that there was a significant difference between food secure and insecure with respect to four variables out of more than fifteen variables of interest discussed in the study, namely: farm size, initial income, use of irrigation and age of household heads.

A brief explanation of the above variables as significant determinants of food security is given below.

Size of farmland: - The larger land per household head, the more the household is ensured with food security.

Irrigation use: - Irrigation usage increases the possibility of raising varied type of food and cash crops as well as the proper handling of animal husbandry, which all result in food secure households. Thus, those resettled households with such practices were found to be food secure as compared to the one who did not. From my observation, there is a good practice vis-à-vis the use of irrigation in Mai-woini.

Age of households: - The study has shown that as age increases the probability of falling into food insecurity increases, i.e., households headed by older people are prone to food insecurity.

Initial Income:-The income brought in by the settler in the form of either an asset (oxen, donkey etc) or cash during the period of arrival served as a hedging for rainy days and become power for cushioning any intended investment in addition to what the resettlers have been provided by the government.

In short, taking into consideration the four explanatory variables; resettlers with a large farmland, higher initial income, access to the use of irrigation and younger household heads were food secure households.

From the above discussion, it can be inferred that resettlement has brought food security to the majority of the resettlers, and the government development program has succeeded .Study on development program will, however, be meaningless if it passes by without touching development effects on environment. It is a simple fact that much of the forestland is brought, now and then, into cultivation followed by increase of human consumption of forestry products for construction, fuel ,furniture and farm and household implements, all resulting in enormous destruction of vegetation in and around the resettlement areas. In a nut shell, the achieved objectives of the development program may not be sustainable if the environmental negative impacts of resettlement continue unchecked.

5.2. Conclusions and Recommendations

Resettlement by itself is not a panacea to food security. Resettled people can still continue to be food insecure unless the stakeholders (including resettlers themselves) make proper interventions. This means, resettlement should be supported by measures that bring about people to be food secure. First and for most, it should be recognized that the long-run target of resettlement is development, and not simply the shifting of people for the purpose of attaining food security. As a result, careful planning and follow up by stakeholders (policy makers, settlers, host population, etc) of sustainable resource management should be strictly observed so as to attain both the short-run and long-run objectives of the program.

The following are also the possible specified recommendations**:**

♦ As age of household has a negative or positive impact on food security, in the study area, the older a households' head is, the less food secure that household will be; older household heads should not take part in resettlement program.

♦ Cultivated land size was found to have a strong and positive correlation with food security. Cultivated land in the study area is, however, limited which means this way of increasing one's farm income is unsustainable. This state of affair, therefore, calls for educating and training resettlers about better land management and conservation practices so as to improve productivity from a given piece of land in addition to employing irrigation schemes.

♦ Initial income of resettlers was found to be positively and significantly related with food security. This state entails equipping resettlers with the necessary initial financial and material support so that the program achieves the desired objectives of the stakeholders.

♦ Finally, but of paramount importance, resettlers should gain adequate knowledge on the use of natural resources use in particular through training and education so as to do away with their unfriendly environmental activities, and transform their area into a developed home.

5.3. Limitations

While this research work examines the effect of resettlement program on food security, it has failed to concretize the effect of the program on environment for different reasons. First, as environment is wider concept given the resource and time the researcher had, it was a must to limit the scope of the study to environment, i.e., deforestation. Second, so as to even objectively measure the extent of deforestation, the researcher has failed to find relevant secondary data. This, however, laid a solid foundation for further study.

The Binary Logit model which was used to show determinants of food security causations did not also tell the whole history of food security for the reason that the resettlers were for instance classified as food secure or insecure with dummy variable 0 & 1, and these don't show the extent (the distance) one is different (far away) from the other in terms of food security. That is, firstly, taking 2,200 kcal per adult equivalent per day to classify respondents as food secure or insecure considers only nutritional status of resettlers. It does not, therefore, take non-food requirement of the resettlers into account for it only measured direct calorie intake of the resettlers. This, thus, for obvious reasons, hides the determinants of food security causations among resettlers at household level.

In knowing the proportion of population who are undernourished in the selected 'Tabias' BMI was computed. In doing so, even though height of resettlers was measured using standard height measurements of selected resettlers, weight of these resettlers was determined by the estimation made by them for the reason that the researcher was highly constrained with finance.

In collecting data related to consumption pattern of study area some respondent resetter were also unable and/or unwilling to provide the required information as consumption survey for each and every food item takes longer.

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APPENDIX:

Appendix 1: Number of resettled households from various Woredas of Tigray Region

S.N	Zone	Woreda	Resettlement year			Total	Remark
			2003	2004	2005		
1		Nader Adet	1048	2056	-	3104	
2		Weri Leke	785	1727	-	2512	

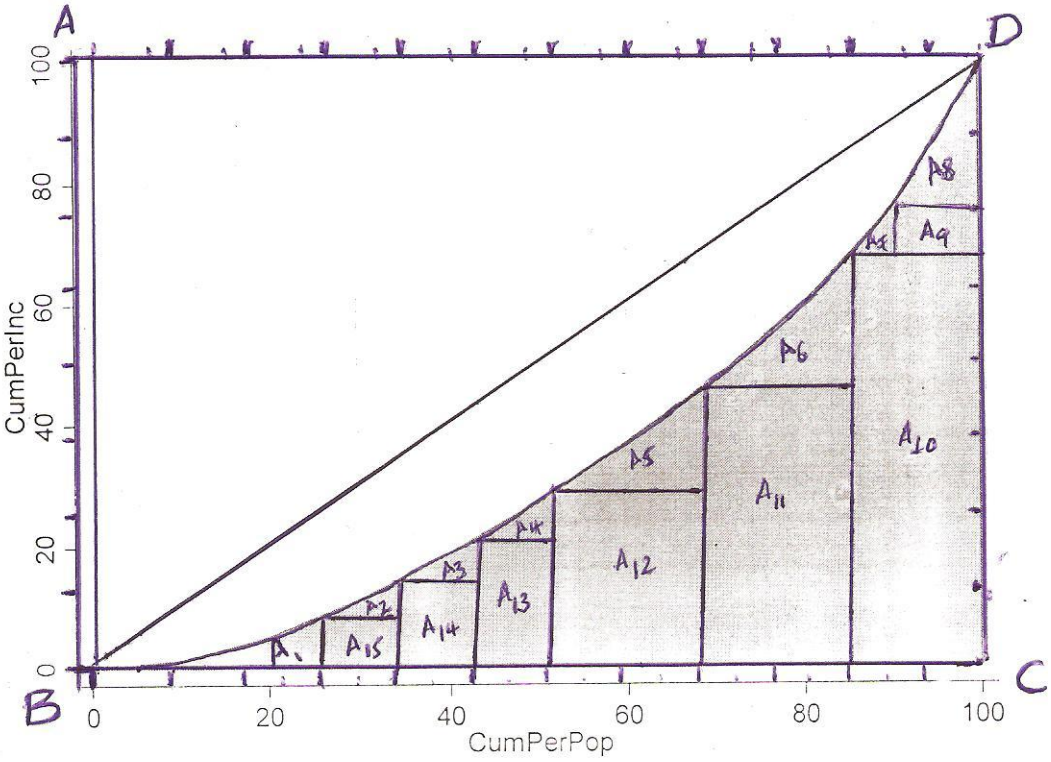
3	**Central**	Kola Temben	716	1265	-	1981	
4		Tanka Abergelle	175	196	-	371	
5		Ahferom	170	-	580	750	
6		G.Adwa	147	287	-	434	
7		Tahtay Maichew	150	-	141	291	
8		Laelay Maichew	84	-	78	162	
9		Merebleke	155	-	-	560	
		Total	**3835**	**5531**	**799**	**10165**	
1	**N.Western**	Tselemti	727	815	1020	2562	
2		Medebaiezana	697	2036	-	2733	
3		Tahtay Koraro	107	754	-	861	
4		Laelay Adyabo	84	-	-	84	
5		Asgede Tsimbla	155	-	-	155	
		Total	**1770**	**3605**	**1020**	**6395**	
1	**Eastern**	Hawzen	50	580	1675	2305	
2		Sasaet Tseda Emba	10	276	944	1230	
3		Gulo Mekeda	10	251	1438	1699	
4		Kilte Awlaelo	10	89	163	307	
5		Atsbi Womberta	10	174	347	531	
6		Ganta Afensume	20	1034	1803	2857	
7		Erop	-	-	364	364	
		Total	**110**	**2404**	**6734**	**9248**	
1		Hintalo Wajirat	7	247	689	943	

2	**Southern**	Raya Azebo	-	101	155	256	
3		Ofla	-	60	604	664	
4		Alamata	-	43	-	43	
5		Samre Saharti	-	102	1122	1224	
6		Enderta	-	29	118	147	
7		Enda Moheni	-	37	364	401	
8		Alaje	-	68	431	499	
		Total	**7**	**687**	**3483**	**4177**	
1	**Western**	Kafta Humera	592	1157	-	1749	
2		Tsegede		270	843	1113	
Total Sum total			**592**	**1427**	**843**	**2862**	
			6314	**13654**	**12879**	**32847**	

Source: DPPC, 2008

Appendix 2: How to compute level of equality among insecure resettled households using food calorie and expenditure.

Cumu % pop.	**0**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
Cumu food exped % pop	**0**	**1.23**	**5.22**	**11.38**	**18.99**	**27.48**	**37.07**	**47.61**	**60.04**	**75.94**	**100**


A
D
B
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CumPerInc
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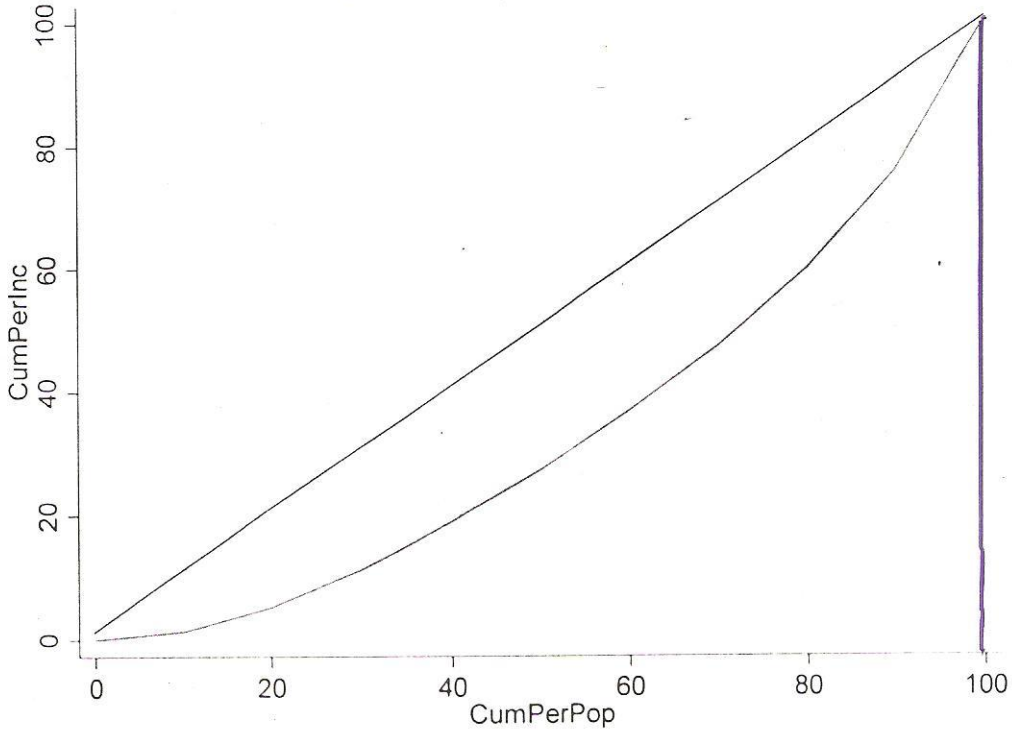
CumPerInc
CumPerPop
0
20
40
60
80
100

Area of triangle= $\sqrt{s(s-a)(s-b)(s-c)}$

Where, a= perpendicular

B= base

C= hypotenuse

S= $-\frac{a+b+c}{2}$

Area$_1$ = $\sqrt{s(s-a)(s-b)(s-c)}$ = $\sqrt{3.4(3.4-0.7)(3.4-3)(3.4-3.1)}$

= $\sqrt{1.10}$ = 1.05cm^2

Area$_2$ = $\sqrt{s(s-a)(s-b)(s-c)}$ = $\sqrt{1.3(1.3-0.5)(1.3-1)(1.3-1.1)}$

$= \sqrt{0.62} = 0.25\text{cm}^2$

$\text{Area}_3 = \sqrt{s(s-a)(s-b)(s-c)} = \sqrt{2.6(2.6-0.5)(2.6-1)(2.6-1.1)}$

$= \sqrt{13.1} = 3.62\ \text{cm}^2$

$\text{Area}_4 = \sqrt{s(s-a)(s-b)(s-c)} = \sqrt{1.4(1.4-0.61)(1.4-1)(1.4-1.2)}$

$= \sqrt{0.09} = 0.29\ \text{cm}^2$

$\text{Area}_5 = \sqrt{s(s-a)(s-b)(s-c)} = \sqrt{2.9(2.9-1.41)(2.9-2)(2.9-2.4)}$

$= \sqrt{1.95} = 1.4\text{cm}^2$

$\text{Area}_6 = \sqrt{s(s-a)(s-b)(s-c)} = \sqrt{3.2(3.2-1.8)(3.2-2.3)(3.2-2.6)}$

$= \sqrt{1.61} = 1.27\text{cm}^2$

$\text{Area}_7 = \sqrt{s(s-a)(s-b)(s-c)} = \sqrt{1.05(1.05-0.7)(1.05-0.5)(1.05-0.9)}$

$= \sqrt{0.031} = 0.17\text{cm}^2$

$\text{Area}_8 = \sqrt{s(s-a)(s-b)(s-c)} = \sqrt{2.65(2.65-2)(2.65-1.1)(2.65-2.2)}$

$= \sqrt{1.20} = 1.09\text{cm}^2$

$\text{Area}_9 = \text{bxh} = 1.1\text{x}0.7 = 0.77\text{cm}^2$

$\text{Area}_{10} = \text{bxh} = 1.8 \text{ x } 5.4 = 9.72\text{cm}^2$

$\text{Area}_{11} = \text{bxh} = 2\text{x}3.7 = 7.4\text{cm}^2$

$\text{Area}_{12} = \text{bxh} = 2\text{x}2.3 = 4.6\text{cm}^2$

$\text{Area}_{13} = \text{bxh} = 1\text{x}1.7 = 1.7\text{cm}^2$

$\text{Area}_{14} = \text{bxh} = 1\text{x}1.1 = 1.1\text{cm}^2$

$\text{Area}_{15} = \text{bxh} = 1\text{x}0.7 = 0.7\text{cm}^2$

So, area under the Lorenz curve =

1.05+0.25+3.26+0.29+1.4+1.27+1.05+1.09+0.77+9.72+7.4+4.6+1.7+1.1+0.7= 36.01cm^2

Area between line of equality and Lorenz curve = area of triangle

BCD – Area under the Lorenz curve

= 47.61 cm^2 -36.01 cm^2 = 11.6cm^2

Gini- coefficient = $\frac{area between line of equality \& lorenz curve}{area of triangle BCD}$

$$\frac{11.6}{47.61} = 0.24$$

Estimating Ω

Ω - is the coefficient of variation in dietary energy supplier, which gives the probability of facing temporary food shortage

CV = $\frac{SD}{X^-}$ x 100

Where, SD, standard Deviation

X'= Arithmetic mean

Thus, X' = $\frac{\sum X}{N} = \frac{239,760}{80} = \underline{2997}$

SD= $\frac{\sqrt{\sum (x - x')2}}{N}$

= $\frac{\sqrt{4831602.28}}{80}$

= $\sqrt{60395}$ = $\underline{245.75}$

Coefficient of variation (CV) = $\frac{245.75}{2997}$ x100 = 8.2%

.Cumulative percentage of population and food calorie intake.

Cumu % pop.	**0**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
Cumu food k cal % pop	**0**	**9.1**	**17.2**	**26.3**	**34.3**	**43.3**	**52.4**	**63.4**	**75.4**	**86.5**	**100**

Appendix 3: Types and Amount of crops produced in Kafta Humera for the year 1995/96 -2001/02

Crop type	Amount of crops produced in Qt.						
	1995/96	**1996/97**	**1997/98**	**1998/99**	**1999/00**	**2000/01**	**2001/02**
Sorghum	604533	576662	939729	580509	1989617	3108126	2,177,649.2
Sesame	349296	621222	900508	660,763	998071	1403548.6	1,428,955.3
Cotton	90643	168879	156245	168910	166720	180498	49,959.6
Millet	22962	11256	18060	9802	13845	7160	37,190.04
Teff	13024	10642	16400	6879	38431	12376	20159.5

Maize	8728	21713	97343	22236	39854	55380	267,300
Nihug	768	1944	2461	2530	2957	3314	7438.05
Bean	616	742	860	387	-	820	3,570.24
Peas	173	2353	3518	7378	3486	5987	9,035.6
Lentile	213	600	407	116	35	42	318.84
Bultug	220	396	4284	-	960	720	2975.4
Nut	-	-	-	-	-	-	880.32
Adengur	-	-	-	-	-	-	1487.7
Chick pea	-	-	-	-	-	-	405

Source: Kafta Humera Bureau of Agriculture, 2001/02

Appendix 4: Adult Equivalence Scale

Years of age	Men	Women
0-1	0.33	0.33
1-2	0.46	0.46
2-3	0.54	0.54
3-5	0.62	0.62
5-7	0.74	0.70
7-10	0.84	0.72
10-12	0.88	0.78
12-14	0.96	0.84
14-16	1.06	0.86
16-18	1.14	0.86
18-30	1.04	0.86
30-60	1.00	0.80
plus	0.84	0.74

Source: Adopted from Feredu Nega (2008).

Appendix 5: Quantity of food used for food poverty lines

Food item	Kcal/100 gram		
Teff	341	Barely	354

Wheat	351
Maize	362
Sorghum	347
Bean	344
Peas	341
Guaya	347
Milk	39
Beef	235
Chicken	140
Egg	68
Coffee	2
Sugar	400
Salt	0

Calanic	149

Cooking Oil	88

Oil	884
Berbere (red pepper)	318
Onion	42
Garlic	149
Potato	87
Green Leaf	24
Lents	320
Onion	42
Tea	29
Tomato	70
Potato	87
Cabbage	25

Source: Feredu Nega (2008)

Appendix 6.Conversion Factors Used to Compute

Tropical Livestock Unit Equivalent

Animal Category	TLU	Animal Category	TLU
Calf	0.25	Donkey (young)	0.35
Weaned Calf	0.34	Camel	1.25
Heifer	0.75	Sheep and Goat (adult)	0.13

Cow and Ox	1.00	Sheep and Goat (young)	0.06
Horse	1.10	Chicken	0.013
Donkey (adult)	0.70		

Source: Ramakrishna and Demeke,(2002).

Appendix 7: Conversion Factors Used to Compute Adult-Equivalent (AE)

Age Group (years)	Male	Female
< 10	0.6	0.6
10 – 13	0.9	0.8
14 – 16	1.00	0.75
17 – 50	1.00	0.75
> 50	1.00	0.75

Appendix: 8 Number of Health Centers, Clinics and Health past in Kafta-Humera Woreda.

S.N	Name of Tabia	Number of Health centers	Number of Nucleus health centers	Number of Clinics	Number of Health posta
1	Mai-Kadra	1			
2	Adebay	1			
3	Addi-Goshu	1			
4	Kafta	1			
5	Bet Hintset				
6	Sola				
7	Baeker	1			1
8	Rawyan				1

9	Mai-Kih				1
10	Endaikedash				1
11	Gyitse				1
12	Hagereselam				1
13	Miglab-Fere				1
14	Bereket				1
15	Ruwasa				1
16	Aidola				1
17	TirKan				1
18	Zerbabit				1
19	Central				1
20	Sheglil				1
	Total	5	-	-	15

Source: Kafta-Humera Woreda Health Bureau.

No	Name of Tabia	1999			2000			2001			1999-2001		
		Newly Admitted	Outpatients	Total	Newly Admitted	Outpatients	Total	Newly Admitted	Outpatients	Total	Newly Admitted	Outpatients	Total
1	Mai-Kadera	25378	3445	28823	14442	1504	15946	18320	931	19251	58140	5880	64020
2	Adeba	9917	1187	11104	11765	1060	12825	10686	259	10945	32368	2506	34874
3	Addi-Gashu	7429	415	7844	8450	335	8785	12360	514	12874	28239	1264	29503
4	Kafta	8666	2328	10994	7285	1663	8948	7575	868	8443	23526	4859	28385
5	Bet-Hintset	1583	383	1066	770	0	720	164	0	164	2517	383	2900
6	Sola	4501	353	4854	1731	45	1776	1530	55	1585	762	453	8215
7	Backer	1385	1782	3167	7583	319	7902	9992	993	10985	28960	3049	32054
8	Rawyan	11024	426	11450	7808	693	8501	2205	703	2908	21037	1822	22859
9	Mai-Keih	3454	0	3454	1558	63	1621	897	2	899	5909	65	5974
10	Endaikedash	5104	357	5461	2876	427	3303	1021	6	1027	9001	790	9791
11	Gyitse	11436	1362	12798	5277	663	5940	3420	111	3531	20133	2136	22269

12	Hagere-Selam	4537	143	4680	2352	56	2408	992	22	1014	7881	221	8102
13	Miglalb Feres	9570	49	9619	4171	13	4184	2933	13	2946	16674	75	16749
14	Bereket	13581	108	13689	8378	135	8513	9485	126	9611	31444	369	31813
15	Ruwyasa	11910	291	12201	4347	13	4360	3065	16	3081	19322	320	19642
16	Aidola	3759	74	3833	2103	39	2142	2490	0	2490	8352	113	8465
17	Tirkan	6264	334	6598	2787	114	2901	3718	18	3736	12679	446	13235
18	Zerbabit	3414	125	3639	421	16	437	156	6	162	3991	147	4138
19	Central /wedeal	5538	184	5722	1342	84	1426	740	0	740	7620	268	7888
20	Sheglil	6057	296	6353	1652	35	1687	1962	0	1962	9671	331	10002
	Total	154507	13642	167349	97098	7277	104325	93711	4643	98354	348226	25497	380878

Appendix: 9 Newly admitted and outpatient in Kafta Humera (1999-2001E.C).

Appendix 10: Fifteen Top Leading Types of Diseases in the Kafta Humera Woreda (1999-2001 E.C)

1999		**2000**		**2001**	
Disease type	Number of inflicted people	Disease type	Number of inflicted people	Disease type	Number of inflicted people
1. Malaria	61932	1. Malaria	8096	1.Malaria	29576
2. Lung disease	22524	2. HIV/AIDs	5407	2.Intestinal parasite	7641
3.Dysentry	21434	3.Intestinal parasites	4194	3.Dysentry	7267
4.Intestinal parasites	8721	4.Upper respiratory infections	3887	4.Upper respiratory infections	6044
5. Flue	7966	5.Lower respiratory infections	1832	5.Lower residuary infections	5810
6. Anemia	7080	6. Dysentery	1615	6.Fever	3271
7.Skin wound	4795	7. Skin wound disease	1216	7.Gastritis	3182

disease					
8.Eye disease	4787	8.Gastitis	1177	8.Skin wound disease	2203
9.Gastritis	4657	9.Lung disease	1099	9.Veneral disease	1013
10.Other intestinal parasites	4136	10.Eye disease	1046	10.Antritist	845
Total	148032	-	29569	--	66,852

Source: Kafta –Humera Woreda Health Centre (2008)

Appendix 11: Agricultural productivity for Sorghum & Sesame (Qt/ha) (Source: Kafta Humera Bureau of Agriculture, 2001/02).

Type of crop	1995/96	1996/97	1998/99	1999/00	2000/01	2001/02	SD	X	CV%
Sorghum	14	15	14	22	24	17.00	4.34	18.35	23
Sesame	3.8	4.9	5	4.9	6.2	6.30	1.11	5.41	20

Appendix 12: Changes in land use/ cover between 2000 and 2007

Land cover/use	**Land sat 2000**		**Land sat 2007**		Change in percent
	Area in hectare	Percent (%)	Area in hectare	Percent (%)	
Arable land	1,964,538,101	26.1	3,931,099802	43.7	**100.1**
Grass land	1,484,424,920	1.90	1,826,218,400	20.3	**23.02**
Settlement	2,549,927	0.03	3,889,593	0.043	**5.2**
Wood land	5,540,845,005	73.68	3,219,089,501	35.84	**-41.9**

Source: Kelemework etal. , 2008 modified by the researcher.

Mekelle University

College of Business and Economics

Department of Management

The Status of Resettled households on food security, the Case of Kafta Humer Woreda, Tigray, Ethiopia.

Questionner for:

Demographic, economic and social characteristics of the household

Part 1. Household information

Woreda ----------

Tabia ----------

Kushet ----------

Table 1 Biography of household members

1	2	3	4	5	6	7	8	9
Serial No	**Name of the Household members**	**Relation to head**	**Age (years)**	**Sex(M=1, F=0)**	**Marital Status**	**Religion**	**Farming system**	**Education level**
1								
2								
3								
4								
5								
6								

Column 3: **1**.HH Head **2.**Wife\husband **3.**child **4.**Relative **5.** Other

Column 6: **1.** Never married **2**. Married **3**. Divorced **4**. Widowed **5.** Others (specify)

Column 7: **1.** Christian **2**. Muslim **3**. Others (specify)

Column 8: **1.** Crop farming **2.** Livestock **3.** Mixed Farming **4.** Others (specify)

Column 9: **1.**Illitrate **2.** Read and write **3.**Primary **4.**Secondary **5.** College

10. What is the main reason for not attending school? (If only illiterate) --------

1. Need to work, **2**. Family not willing **3.** Too expensive **4.** No school around

5. Illness **6.** Do not know the value of education **7.** Disable **8.** Others (specify)

11. Where is your original birth place? ----------

12. When did you arrive at the resettlement site? ----------

13. Did you arrive with all your family? 1. Yes□ 2.No □

14. If the answer for question no.13 is" No", are you now living with your family?

1. Yes□ 2.No □

15. If answer for question no.14 is "yes", when did your family arrive in this resettlement site? --------

16. What pushed/pulled you to come to this resettlement site? ----------
---

17. Have you got the program as your expectations? ----------
---

18. Have you got returned to place where you have come from? 1. Yes□ 2.No □

19. If answer for question no. 18 is 'Yes', what was the purpose of your travel?

20. If again 'yes', Specify year and month of travel

Year	Month	No. of Travel ,-----times	Reason

Part 2.Land resources

2.1 What is the HH's land size in 'Tsimad'(hec.)? (Directly belonging to HH)? _____in Tsimad(ha).On average farm land is situated-------(Types**:**1.'Rogid', 2.'Makelay', 3.'Rekik')

2.2 What is the total area of land you cultivated in 2001 EC? _____in Tsimad(hectare)

1. Owned _____ 2 Rented in _____

3. Share cropped ____ 4 .Received as a gift_____ 5. Others (specify) _____

2.3. What proportion of your cultivated land is allotted to the following in hectare?

1. Annual crops _____ 2. Perennials (Fruit & Vegetable) _____

2.4 List the type of crops you cultivated and their average production for the year 2001 EC.

Table 2.Cultivated land under different crop and amount of economic yield

Type of crops	2001 EC	
	Area (ha / Tsimad)	Total Production (Qt)
Annual crops		

1		
2		
3		
4		
5		
Perennial crops		
1		
2		
3		

2.5 Do you use any irrigation scheme? _____1. Yes 2. No

2.6 If 'yes' what type of it? _____1. Modern 2. Traditional 3. Both

2.7 If' yes' what types of crops did you produce using irrigation?

Types of crops, vegetables	2001 EC				
	Area (Tsimad)	Production (Qt)			
		Consumed	Estimated Value	Sold	Value
1					
2					
3					

2.8 List the types of insects and pests attacking your agriculture 1. _____ 2. _____ 3. _____ 4. _____ 5. _____

2.9 What do you use to plough your land?

Oxen □ , Ox with Camel □ , Rented tractor □ , Camel only □ ,Hand tools/hoes □

Part 3. Use of modern Agricultural Inputs

3.1 Did you use chemical fertilizers? _____1. Yes □ 2. No □

3.2 If 'No' state your reasons in the order of their importance 1. Not necessary for cultivated crops 2. Too expensive 3. Not available 4. Shortage of income 5. Lack of credit 6. Specify other reasons _____

3.3 If 'yes' to 3.1, indicate the amount of fertilizer used in 2001 EC

Type of crops	2001			
	Fertilizer(Qt)			
	Urea	Dap	Area Tsimad(ha)	
			Urea	Dap
1				
2				
3				

3.4 Did you use improved seed on your farm in 2001 EC? _____1.Yes 2. No

3.5 If 'No' state your reasons: _____1. Not heard about it 2. Not available (no supply)

3. Too expensive 4. No yield difference 5. Other reasons (specify) _____

3.6 Have you lost your crop during the last year? _____ 1. Yes 2. No

3.7 If 'yes', what were the causes? 1. Diseases 2. Pest 3. Weeds 4. Flood 5. Drought 6. Others

3.8 If your answer to question no. 3.6 is "yes", specify the type of crops lost along with extent lost? __

Type of crops	Area Tsimad(ha)	Causes of loss	Amount of loss (Qt)
1			
2			
3			

3.9 Did you apply chemicals/pesticides on your crops? _____1. Yes 2. No

3.10 If no, why? _____1. Does not help 2. No problem of weed or pest 3. Too expensive 4. Not available 5. Not heard about it 6. Others (specify) _____

Part 4. Livestock production

4.1 Do you own livestock? _____1. Yes 2. No

4.2 If 'yes', indicate the number of livestock owned:

No	Type of Livestock	Number Owned
1		
2		
3		

4.3 Indicate the number of livestock owned before coming here (i.e. original)

No	Type of Livestock	Number Owned
1		
2		
3		

4.4 Do you use oxen for your farm operation? _____1. Yes 2. No

4.5 If 'yes', are your oxen enough for your farm operations? _____1. Yes 2. No

4.6 If you don't have enough oxen, how do you get additional oxen you need? _____

1. Hire from someone 2. Coupling with other farmer 3. Borrow from friends 4. By contributing labor to a person who has oxen. 5. Others (specify) _____

4.7 Do you have enough feed for your animals? _____1. Yes 2. No

4.8 If 'yes' what are the sources according to their importance? (Specify estimated size of area) (Multiple answers possible) 1. Own grazing land---- 2. Communal grazing land--- 3. Crop by-products----- 4. Others (specify) _____

4.9 If 'No' how do you cover the deficit? 1. _____2. _____ 3. _____ 4. _____

4.10 Is animal disease a problem to you? _____1. Yes 2. No

4.11 If 'yes', do you get enough drugs to treat your animals?_____1. Yes 2. No

Part 5. Household income

5.1 Do you or any member of your family have off-farm/non-farm job? _1. Yes 2. No

5.2 If 'yes', indicate the type of work and annual income for the year 2001 EC

Family Member	Type of Jobs (see below)	Annual income (Birr)*
1		
2		
4		
Total		

* If payments were made in kind, convert them to Birr at the prevailing price.

Types of jobs 1. Weaving/spinning 2. Milling 3. Other handcrafts (pottery, metal works, etc.) 4. Livestock trade 5. Sale of local drinks 6. Agricultural employment 7. Pity trade (grain, vegetables, fruits, etc.) 8. Sell of firewood and grass 9. Daily labor 10. Traditional gold mining 11. Others (specify)

5.3 Have the household received any other income (such as remittances, gifts, aid or other transfers) in 2001 EC. _____1. Yes 2. No

5.4 If yes complete the following table.

Types of receipt	**Person who received income**	**Amount received (Birr)**	**The source**
Total			

5.5 Would you please state how the household has earned annually from the following income sources (in 2001 EC)

S.N	Sources of income	Estimated Income
1	Crop sales	
2	Fruit &vegetable sales	
3	Animal sales	
4	Sales of animal by-products	
5	Wild food & wood sales	
6	Food aid	
7	Relative	
8	Self employment	
9	Non -farm income	

5.6 Did you come in this resettlement site with initial asset or capital other than the birr given for the purpose of reestablishment? 1. Yes 2. No

5.7 If your answer to question no.6.6 is ‘yes’, indicate it

A, Cash------

B, Livestock (birr) -----

Part 6. Access to various services

How far do you travel to get :	Distance	
	Km	Min
your farm land?		
the services of primary school?		
the services of secondary school?		
the services of clinic/health post?		
the services of hospital?		
the services of grain mill?		
the services of all weather road?		
drinking water?		
the nearest animal health post/clinic?		
agricultural extension service?		

7.1 Consumption pattern of households for the last 12 months.

Food type consumed	Per week	from purchased	from own harvest	from food aid	From gift/remittance
	Amount(Kg)	Amount *[Kg]*	Amount *[Kg]*	Amount *[Kg]*	Amount *[Kg]*
Cereals		birr	birr	birr	birr
Sorghum					
Maize					
Teff					
Millet					
Others					
Pulses					
Soybean					
Haricot bean					
Chick peas					
Horticulture					
Mango					
Banana					
Others					
Animal source					
Milk products					
Meat					
Chicken					
Eggs					
Cash crops					
Coffee					

Chat					
Others					
Salt					
Oil					
Sugar					

Non-food expenditure

Would you tell me the household's non-food expenditure of the year 2001 EC?

Item	Total Estimated expenditure
Private goods	
Clothes and shoes	
Cosmetics	
Entertainment	
Public goods	
Kitchen equipment	
Furniture	
Building material for house	
Ceremonial expense	

Contribution to *EDIR*	
Donation to Community church/Mosque	
Taxes	
Modern medical treatment and medicine for human	
Total expenses for animal disease	
Traditional medical treatment and medicine	
School fees	
Farm inputs	
Farm implements	
Farm oxen	
Fuel	
Transportation	
Others specify ----------	
Miscellaneous	

Part 8 Household assets

8.1 If you have the following items currently, please complete the following table.

Items	Amount	Estimated value in Birr
House		
Stored agricultural produce		
Valuables		
Jewelry and watches		
Agricultural equipment		
Hoe		
Maresha		
Sickle		
Axe		
Others		
Non agricultural equipment		
Carpenter equipment		
Black smith equipment		
Weaving equipment		
Building equipment		
Others		
Household goods		
Bed		
Tables & chairs		

Radio/tape recorder		
Sanduk, Kumsaten		
Other kitchen equipment		

9. Forestry related questions

10.1 What are the major causes for the disappearance of forest/trees in your community?

1. Bringing forest land in to agriculture. /intensive cultivation

2. Human consumption for fuel & other necessities

3. Livestock grazing & fodder settlements

10.2 What are the main sources of fuel?

1. Wood

2. Cow Dung

3. Crop Residue

10.3 Where are the main sources of fuel wood?

1. Homestead

2. Community forest

3. Buying

4. Collecting from open forest access

5. Homestead and open forest access

10.4 What is your average wood consumption with in a month? (Per donkey load)--------

10.5 Have you grown trees in your farmland? Yes □ no □

10.6 If your answer for question no.10.5 is ‘yes’, how many trees do you have in your cultivable farm land? ------Trees with in----- Tsimad(ha)

10.7 How many Trees did you get before resettlement and after resettlement in your residential area? ----------&----------.